RICE

WORLD CROPS

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SOILS, CHEMICALS, IRRIGATION, ENGINEERING AND ECONOMICS

VOLUME 8, No. 8 AUGUST 1956

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Vol. 8, No. 8

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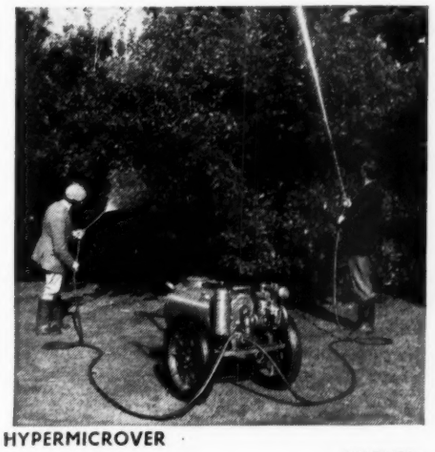

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Editorial Comment

As you sow . . .

THE complete line of our heading reads ' For as you sow, ye are like to reap '; it is an oft-quoted line from Butler's *Hudibras*, based, in the first instance, on an admonition in one of the Pauline epistles.

Nevertheless, these words quoted in an endeavour to uplift the general morality can be applied equally in a strict literal sense. All but the most backward farming communities must surely be aware of this, and even the backward now are having this lesson brought home to them. Among the forerunners in bringing agricultural education to underdeveloped and backward areas is FAO, who believe that applied modern science and technology can make improved living standards possible for rice-eating people, and for this purpose the Organisation has instituted many forward schemes. The latest figures published by FAO show that wheat continues to be the major crop grown by man, but rice is the major crop he harvests.

These same figures (published in ' Yearbook of Food and Agricultural Statistics—Production, 1955') show that world production of wheat in 1954 was 151.5 million metric tons from a total area of 135 million ha., whereas rice was planted on only 97.4 million ha., but the yield was greater than for wheat, bringing total production for 1954 to 162.2 million tons of paddy.

On this evidence we can affirm with the authors of this month's feature article ' . . . Rice production, therefore, remains the most important agricultural activity of a large proportion of the world's most densely populated regions, and is likely to remain so far into the foreseeable future '.

Stars at Fernhurst

A GALAXY of eminent scientists and technologists converged at a point near the tiny English village of Fernhurst (England) recently. Coming from places as far afield as Moscow, Peking, Turrialba and Melbourne, they were meeting to hear and discuss papers dealing with most aspects of crop protection. This international conference is the second to be sponsored by Plant Protection Ltd. and a measure of its success can be gauged from the fact that not less than 200 delegates were present. The conference provided a platform on which international authorities could discuss crop protection in relation to the world's food supplies at a high scientific level. The subjects discussed included means of combating weeds, insect pests and diseases, which account for the loss of at least half the world's food supplies every year. At the inaugural luncheon in London, Mr. R. A. Butler, Lord Privy Seal, was the guest of honour and he stressed the importance of the conference, both as a contribution towards increasing world food production and as an example of co-operation by scientists from all countries.

The conference closed too late for a detailed report to appear in this issue of WORLD CROPS, but a summary of the principal papers will be published in another issue.

Soil erosion in Africa

THE problem of desiccation and erosion in lands south of the Sahara was debated at some length in the House of Lords recently. Life and health in any country depend on water and climate, and these are being seriously threatened in certain parts of Africa, according to Lord Portsmouth, who opened the debate. In his opinion the Government should take immediate administrative action in lands under their control. In other adjoining areas they should seek co-operation with other governments.

Along a great northern stretch of Africa south of the Sahara the Sahara is the common enemy of all States. That area—1 million sq. miles—is the heart of Equatorial Africa and desiccation is taking place rapidly there. Nor are natural causes alone responsible. The ignorance of the inhabitants often helps forward the process, for nomadic tribesmen continually over-graze the land and honey-hunters and game poachers destroy by fire thousands of acres of forest in pursuit of small gains. The British Government are, perhaps, as Lord Portsmouth suggested, more concerned with building Parliament houses and with spending money on uplift than with the basic realities of the situation. What is really wanted is better roads and more water supplies. Now that the troubles of the Mau Mau rebellion are diminishing, many level-headed Africans would be willing to co-operate in schemes for reclamation and at the present it would be relatively easy to acquire land for afforestation.

The urgent need, according to Lord Listowell, is to demonstrate on the farms to Africans the value of up-to-date methods. The Government should put the questions of desiccation and erosion before the international committee at present in existence in that part of Africa.

More leadership from the Colonial Office and local governments was called for by Lord Milverton, who added that Africans were often hide-bound by tribal custom in their methods of farming. This, however, could be overcome by example and determination.

An interesting contribution was made to the debate by Lord Thurlow, who was a field commander in Kenya during the Mau Mau uprising. He said that a great deal of capital would be needed to develop water

supplies, farming and afforestation in the area. He was horrified to find in Kenya signs of the wrong kind of settler. 'There are people going out to East Africa—none of them British that I know—and companies buying up land and working it as hard as they possibly can for a few years, making big profits and then going out, leaving complete desert behind them'.

Replying for the Government, Lord Munster denied that there was any solid basis for the belief that the Sahara Desert was encroaching on the fertile areas south of it. The Government was well aware of the problem of erosion and of the causes. But the colonial agricultural departments and research organisations were taking measures to arrest it and restore to fertility areas already eroded. To succeed in this work the Government would have to take the African people with them, necessarily a slow process. The strength of forestry staff employed south of the Sahara had risen from 1,649 before the war to 5,316 at present. The Secretary of State's forestry adviser is shortly to visit Kenya, Uganda and Tanganyika and will look particularly into the problem of the arid areas.

Plan for Pakistan

AN Economists' Conference has endorsed the Planning Board's recommendations on land reforms in East and West Pakistan and has approved the development priorities laid down in the draft Five-Year Plan.

Endorsing the recommendations of the Planning Board about land reforms, the Conference said that, in its opinion, a system of owner-cultivators was most desirable, but considered that the complete abolition of the ownership rights of non-cultivating owners might have undesirable social and economic consequences. It felt that a ceiling on ownership of land and the safeguarding of the rights of the tenants would go a long way in reducing the evils of the existing pattern of land ownership. The Conference considered that the recommended ceiling of 150 acres for ownership of land in West Pakistan in the case of irrigated land, with appropriate adjustments in the case of other lands, had a good chance of acceptance and would result in the transfer of very large areas of land to actual cultivators. The Conference emphasised that this ceiling was intended for a family and not for each member of a family and that legislation should be framed to prevent transfers in the name of minors and other dependants.

The Conference expressed the view that compensation to expropriated landlords should be calculated as a multiple of net assets, which in turn should be related to the land revenue charge. The compensation to be paid to large land owners should be a smaller multiple of the net assets than in the case of small owners. The Conference came to the conclusion that compensation should be paid in non-negotiable but heritable bonds which might be liquidated over a 20-year period. It recommended that until the land reforms were implemented an element of progression should be introduced in the land revenue. If necessary, a progressive land revenue might be amalgamated with the existing agricultural income tax. It also recommended that until the implementation of the land reforms existing owners owning more land than the suggested ceiling should be debarred from acquiring additional land. The Conference recommended the implementation of the land reform legislation enacted in 1950 in East Pakistan, but pointed out that this legislation did not afford any protection to share-croppers, who cultivate about one-fifth of the total land. It recommended the revision of this legislation to safeguard the interest of share-croppers.

The report considered that the plan very rightly stressed the expansion of agricultural production and the strengthening of the rural economy. With the population of Pakistan 90% rural and 75% of the labour force engaged in agriculture, and with agriculture alone accounting for more than half of the national output, the emphasis on agriculture was fully justified.

The report described the achievement of self-sufficiency in food and a more diversified and valuable agricultural production as major objectives and the development of the rural economy a challenging task requiring tremendous drive and determined leadership.

It is believed that the Board has done its best to bring about a reasonable balance in the rate of development in the two wings of the country and we shall watch the course of this Five-Year Plan with interest.

'Topping' pastures

MUCH of the value of a large proportion of grazing land is lost every year by allowing the grass plants to flower and seed. Seed heads and stalks are not readily eaten by stock and, if eaten, have very little food value compared with young leafy grass. Furthermore, the process of seeding uses up plant food in the soil and causes the pasture to deteriorate.

Provided a sufficient number of stock is being carried, properly planned strip or rotational grazing will do much to prevent seed heads being produced. If, however, seed heads do develop, a mower should be run over the pasture. The machine should be set high enough to avoid cutting the sole of grass. 'Topping' the pasture in this way will also help to keep weeds in check.

Far too few farmers appreciate the value of 'topping' in the management of their grassland; indeed, some consider it wasteful of grass. The opposite is true, as it stimulates the growth of young, fresh, leafy grass and thus actually increases the output from pastures in the late summer and autumn. The formation of flowering heads and seeds not only limits the growth of leafy

herbage, but also reduces the food stored in the roots of the plants. This leads to lowered vitality, with the result that, in pastures which are allowed repeatedly to run to seed, the better grasses tend to die out and weed grasses take their place.

In the case of pastures which are being grazed rotationally, 'topping' should be done on the day before the end of a grazing period. When cut at this time a large proportion of the seed heads and stalks will be eaten after they become slightly wilted. This applies particularly to the clumps of grass around patches of dung which invariably 'run to seed'. This grass is carried a short distance from the dung patches on the cutter bar of the mower and is then usually eaten quite readily.

Europe and fertilisers

THE latest OEEC report on fertilisers—which covers the period 1953–56—shows that generally in Europe 1954–55 was a year of slower expansion. This seems mainly attributable to 1954's bad weather. Even where low rates of use have been rising sharply in recent years, as in Ireland, bad weather damped down the momentum of this upward movement. This is certainly regrettable, but it is at least a reminder that fertiliser purchase depends upon farming's economic background. Poor harvests, as many of 1954's harvests must be described, tend to tighten farmers' purse strings. Taking the OEEC area as a whole, nitrogen use rose by 7%, compared with a 9% increase in the previous year. This is a better story than that for phosphates and potash; phosphates rose by only 3% against 14% the year before, and potash by 4% compared with 11%. However, it is possibly some consolation that the use of all three nutrients actually increased at all in one of the most unfriendly postwar years of European farming. After all, annual production of fertilisers in the OEEC countries is now close to the 3 million tons mark *for each nutrient*, and this represents more than half the tonnage given by FAO for world production and consumption (excluding the unknown tonnages of U.S.S.R., China etc.). A rate of use so obviously above world average is less likely to show expansion under adverse conditions—yet it did.

Taking country figures reveals a somewhat different tale. A fall in U.K. fertiliser consumption was apparent in 1954–55; although nitrogen went up by 3% and potash by 0.5%, phosphates fell by 12%. There were falls of much the same order in Belgium, Denmark, Holland and Portugal. Other countries showed increases despite poor weather, or in a very few cases had an unchanged fertiliser consumption. What is perhaps a marked feature of these changes is that, broadly, declines have been registered by phosphates or potash or both, but rarely by nitrogen—yet one might have expected nitrogen dressings in particular to be restricted in a cold, wet summer. The explanation probably is that the momentum for increases in nitrogen usage is greater than that for the other two nutrients and it therefore suffered less check from the adverse climatic influences.

Gala sorghum harvest

WITH a few acres, a mule and some help from neighbours, the molasses maker in the U.S.A. can be farmer, manufacturer and distributor, all in one. This highly individualistic business flourishes in the South, where the warm climate is ideal for sorghum grains.

The small farmer's methods are primitive, but have their advantages. He is completely independent, has no payroll to meet, no labour-management problems, no expensive machinery to maintain and no advertising expenses. The product is a rich, sweet syrup which gives added food value to his diet. It is known both as sorghum and molasses and serves as a topping for the traditional buckwheat cakes of the South and the corn bread and hot biscuits (scones).

Introduced into the U.S.A. in the mid-19th century, now 6½ million acres are devoted to the harvesting of sorghum grain, the average yield being 120 million bushels. Sorghum is used most widely as a forage crop. The high sugar content makes it especially valuable for fattening pigs, and the seeds are used by poultry growers to increase the output of laying hens. As meal, flour and cereal, it has found increased uses in the human diet. It has never been a good source of sugar, however, as it is difficult to make the juice crystallise. Recently sorghum has found industrial uses. Starch extracted from it is an ingredient of drilling mud for oil wells. Wax, salad oil and grain alcohol are other by-products.

In the beautiful State of Kentucky, famous for its mountain scenery and leisurely way of life, the small farmers still use sorghum for making syrup. Usually the work of the harvest and the syrup are shared by several farms. To do the job alone a man would have to neglect his other crops, his maize, potatoes and clover.

In spite of the gala atmosphere, making sorghum is hard work. To escape the breathless heat of midday, the farmers rise at 2 a.m. while cutting the grain, and work until evening, taking a long rest in the afternoon. The cane is cut by hand and squeezed in a small, primitive mill operated by mule power. The juice is boiled until much of the water has evaporated and a syrup texture achieved. During the boiling process a green chlorophyll residue must be scooped out of the vat or it will give the molasses a bitter taste.

In about a week's time the field has been cleared and the syrup boiled and bottled. Some of it may be sold to

local stores and restaurants. The neighbours' efforts are rewarded with jugs of molasses. Each harvest provides every household with enough sweetening agent to last until the next crop is sown.

This is an interesting sidelight on an agricultural industry that had its beginning when a few seeds of sorghum were shipped to America from China in 1855.

French roadblocks

FRENCH farmers, demanding more financial aid from the Government, have recently aired their grievances forcibly by throwing roadblocks across the national highways. This was timed for a Saturday so as to cause the maximum inconvenience to road users. Gigantic traffic jams involved hundreds of American and foreign tourists and hundreds of thousands of French people from Paris and other large cities who were bound for the Riviera and other seaside resorts over the holiday weekend.

The efforts of the farmers were determined and on a large scale. Blocks of concrete a cubic yard in size and felled trees were used, and long lines of farm tractors and hay wagons were driven at crawling pace along the roads. Groups of farmers and motorists indulged in violent abuse and no doubt ugly incidents would have occurred had not scores of police been rapidly mobilised with bulldozers to clear the obstructions and with tear-gas to disperse the crowds. The demonstrations were organised by farmers' federations and supported by the Poujade anti-tax party, which has 47 members in the French Assembly.

In some districts the farmers acted more reasonably. After calling the attention of the tourist traffic to their grievances, they distributed gifts of wine and farm produce and removed the roadblocks.

The widespread nature of the disturbances can be judged from the fact that roadblocks were set up in 60 of the 94 Departments of France.

Machinery sales decline

A FALL of about 20%, based on 1955 production, in the current year's sales of agricultural machinery manufactured in the U.K. was predicted recently. Home sales, after a steady decline, reached their lowest point in April this year. This decline was also reflected in the sales of tractors and the lessening in tractor output in April was particularly marked.

A report published by the Agricultural Engineers Association (London) says that in export-markets U.K. tractor manufacturers have lost considerable ground to German competitors. In several countries where the relative position of the U.K. and German industries was about the same in 1955, 1956 has shown a marked advance by German manufacturers.

The report goes on to say that the increased value of U.K. exports of agricultural machinery is the result of selling smaller quantities at higher prices; exports may be as much as 10% down in numbers. It is notable that several types of machine sold less widely abroad in 1955 than in 1954 and this trend continues.

U.S. as well as German exports are progressing much faster than those of the U.K., with the result that a fair proportion of markets is being lost year by year. But in overseas tractor markets, despite German leadership in those outside the Commonwealth, there is every chance that no further ground will be lost. The trend of German prices is said to be rising more rapidly than that for the U.K. industry.

This general decline indicates that the market for both tractors and agricultural machinery has returned to the depressed level which was shown earlier this year. It was thought then that the European cold spell was a factor restricting sales, but the fall in demand is now seen as an established trend.

Artificial rainfall

DETAILS of experiments recently carried out in East Africa to induce rainfall in districts suffering from severe drought have been given in the British House of Commons by the Colonial Secretary. The district chosen was Tabora, a railway junction and administrative centre in the Western Province of Tanganyika.

Tabora and the surrounding district depends largely for its water supply on the Kazima Dam, the level of which had fallen dangerously low by March of this year, owing to failure of the usual seasonal rains. It was decided to carry out a ' cloud-seeding ' technique evolved by the East African Meteorological Department, in conjunction with the Admiralty and the Ministry of Supply.

The essence of the technique was the firing of 2-in. naval rockets, modified to incorporate particles of sea salt, into the air, about 1½ miles downwind of the Kazima Dam catchment area. It was calculated that the best height for the bursting of these rockets was about 3,000 ft. From the details of the outcome of these experiments given by the Colonial Secretary there seems little doubt of their success. From 12 April to 2 May some 37 rockets were discharged. The result was a rise of 2.5 in. in the level of the dam, despite a daily consumption of 250,000 gal. and a high loss by evaporation.

The rainfall recorded in the area of experiment was between 1 in. and 1.5 in. higher than those recorded at stations near to, but outside, the catchment area.

No doubt, after the dubious summer weather experienced recently in Britain, most British people will fervently hope that the authorities will keep their experiments in artificial rainfall to East Africa.

In an effort to increase the production of rice FAO is assisting the Government of Ceylon's schemes for growing rice in the dry zones of the country. Here farmers prepare paddy fields near the village of Gal Oya

RICE

AN ECONOMIC AND AGRONOMIC SUMMARY

(*Prepared by Members of the Staff of FAO*)

Rice is the basic food of more than half of the world's people. FAO believes that modern applied science and technology can make improved living standards possible for rice-eating people, and that it should be possible to provide up to 50% more rice from areas already under cultivation. The authors of this present paper have carefully analysed the present-day position with respect to rice and they place particular emphasis on the economic and agronomic aspects.

RICE is not only the main food of about half the world's people; it is also, in cash terms, the world's most valuable crop. Present world production (including an estimated 70 million tons for the Chinese mainland) is over 190 million tons per year. The value of this crop equals that of wheat and exceeds not only that of such other crops as maize, cotton or sugar, but also that of coal or of pig iron. Moreover, in the Far East rice provides the main source of income for about 70% of the thousand million people whose staple diet it forms. Though rice is known to be grown in about 95 different countries, it is the Far East, or monsoon Asia, that produces the major part of the world's rice crop. This has always been so and there is no reason to expect any considerable change in the geographical balance of production, although in the immediate post-war years scarcity and high prices did stimulate rice growing in a number of non-Asian countries, most notably in the U.S.A., Brazil, Egypt and Italy. Thus the annual average of world production (excluding the U.S.S.R.) of paddy between 1934 and 1938 was estimated at 151 million metric tons, of which 144 million were produced in the Far East. In 1953 total world production was estimated to be about 190 million tons (Asia = 175 million).

The years since the war have been difficult ones for rice eaters and more recently for rice exporters. The war years brought physical destruction and economic dislocation to much of Asia and in 1945 world production of rice was down about 15%. It was not until 1949 that world production again reached prewar levels. Even then this was a world figure and it was not until 1952 that Asian production regained its prewar level, by which time there were 100 million more people to feed in the area than before the war. During the period of great scarcity the people of the Far East supplemented their decreased rice diets with increased amounts of other cereals and with various tubers—or often just ate less.

Buyer's market

Towards the end of 1952 there was a radical change in the rice situation. High prices had stimulated production and restricted demand. In 1952–53 larger crops were reaped in every continent and in 1953 there was an even sharper rise in production. The greatest part of this production rise took place in Asian importing countries and the effects on the world rice trade were very marked. From 1952 to 1953 India's imports fell by about three-quarters and Indonesia's by more than one-half. Within a short time the firm seller's market, which had been undisturbed for almost a decade, was converted to an equally decided buyer's market and stocks in South-East Asia began to accumulate to an abnormal degree.

For the last three years this situation has continued to rule, with exporting countries unable to find buyers for as much rice as they have wished to sell. Some corrective factors have, however, begun to operate to ease the strain of the sudden change in the nature of the market. Restrictions on rice consumption have been gradually removed with the abolition of rationing almost everywhere except in Japan. Foreign trade has been liberalised. Producing countries are paying more attention to meeting consumer preferences and old stocks which had deteriorated are being sold off at low prices for stock feed. The fall in prices that has accompanied the change of balance has reduced exports to the Far East from other regions and the burden of stock-holding has been partly shifted to North America and the Mediterranean countries, and in these countries measures are being taken to reduce stocks. The 1956 acreage in the U.S.A. will be about 13·3% below that of 1955 and 35% below that of 1954, a total reduction of 350,000 ha. in two years. In Italy price measures are being taken to reduce production in 1956. In other important rice - exporting countries there is at present no indication of any restrictions of production, but there are, nevertheless, indications of a slowing down, or even a halt, in the expansion of area, with the notable exception of Egypt.

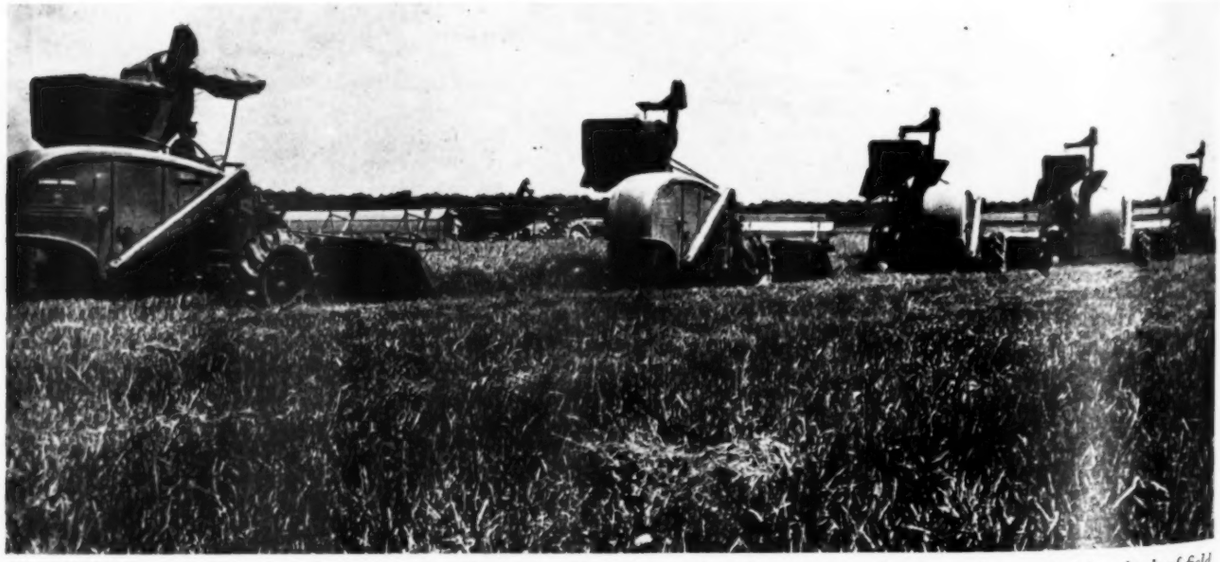
All the indications at the moment, in fact, are that in the absence of wars or large-scale civil unrest, and failing any unexpected change in the price or supply situation of other possible substitute foods, the balance is being restored to world rice markets.

Increased consumption

It is, however, desirable in the widest sense that stability should be accompanied by a steady and considerable increase in rice consumption. For lack of statistics it is difficult to reach any very precise figure, but it seems that in the predominantly rice-consuming populations of the Far East average daily rice consumption is in the vicinity of 275 g. (or less than 11 oz.) per head, and that their total intake of calories per day ranges from 1,800 to 2,200 per person, which is usually insufficient for health and efficiency. A larger intake of such foodstuffs as meat, fish, milk, eggs and vegetables is especially needed in these areas, but the most practical immediate way of raising their consumption level seems to be through higher rice consumption. Past experience of some Far Eastern countries in prosperous times suggests that if real incomes, in fact, were much higher than at present rice consumption might increase very substantially.

World rice economy in recent years has been the subject of a good deal of international consultation, which culminated in the establishment of a special consultative sub-committee on rice of the Committee on Commodity Problems of the Food and Agriculture Organisation (FAO) of the United Nations. This sub-committee is to meet at the end of this year, when it is expected that more than 20 countries will be represented, but already a preliminary working party has considered some of the problems to be faced by the meeting.

Fundamental to the problems of the world rice economy is the lack of knowledge of it. Rice is mostly grown in parts of the world where statistical services are not well developed. A very large part of the rice produced is consumed on the farm and much that



Five of the latest-type rice combines work steadily across a field, harvesting rice at a rate that formerly required hundreds of field hands. This plantation is in the southern State of Louisiana, U.S.A.

enters into trade is traded only on a village-to-village scale, often in areas far away from administrative centres. There is very little common ground between countries on statistical terms and definitions, so there is very little comparability between country statistics.

So the improvement of rice statistics is a subject which will bulk large on the agenda of the meeting later this year.

Increasing rice consumption to levels more consonant with food requirements is another problem which is to be discussed. This aim may possibly be fulfilled through economic measures, but much must still be learned of the degree to which prices are related to consumption and also how consumption is affected by prices and availabilities of other similar foods. Closer study of and attention to consumer preferences is seen as another major measure through which higher consumption may be attained, although with thousands of varieties of rice with differing qualities being produced, and lacking any very clear picture of the qualities which rice-eating populations favour, this is a field in which much investigation still remains to be done.

In turn these investigations of means of increasing rice consumption place the need for assuring equilibrium in the rice economy in an even stronger light. Several methods—such as an international buffer stock, the co-ordination of publicly managed national stocks, multi-lateral contracts and export quota schemes—have already been proposed and discussion of them will also take place at the meeting referred to above.

A Thai woman farmer works in the fields where rice and teak are grown consecutively. The farmers are granted the right to clear the land on Government reserves to plant rice for one year, providing they also plant teak trees. After one year they move on to other areas, leaving the teak to grow, thus renewing the country's teak resources

Physical aspects

Consideration of the physical aspects of rice production must also be based primarily on practices and possibilities in the Far East. For some years now FAO has, through the International Rice Commission (I.R.C.) (to which 26 countries now belong), helped to encourage and co-ordinate developments designed to increase the productivity of rice farmers throughout the area. Originally, the Commission's principal field activity was the very large co-operative hybridisation programme, centred on the Indian Government's research station at Cuttack. The aim of this project was to encourage, by demonstration and by production of numerous hybrids, a greater interest in the possibilities of rice breeding throughout the area, although a full-scale research breeding programme of this type can, of course, only be carried out at a properly equipped research station. The scheme originally aimed at combining the high-yielding properties of the *indica* varieties with the good fertiliser reaction of *japonica*. By 1955 the programme had gone far enough for selected new strains to have been distributed to member countries for testing under local conditions. In the meanwhile, work of one of the newer working parties of the I.R.C., that on mechanisation, has drawn attention to another aspect of breeding, to which some attention will have to be devoted. This working party, discussing the mechanisation of wet paddy, pointed out that in the Far East generally one of the difficulties is that varieties of rice suitable for mechanised handling are not yet being grown. This also will presumably have to be taken into account in future breeding programmes.

Quite apart from the expansion into individual countries of the overall hybridisation programme, there is plenty of work that needs to be done at a simpler level within these countries themselves. FAO, in fact, has repeatedly emphasised that first results will probably be obtained by the selection and improvement of local varieties, which does not need the large set-up, with its highly trained staff, required for a big hybridisation programme. Straightforward selection of the best existing local varieties, in fact, remains the basic need for any improvement programme in most of the countries concerned.

The general problem of increasing the productivity of rice-growing areas is also being tackled in a number of other ways through the I.R.C., as well as in the countries themselves. The Commission has, for example, had for some years a special working group on fertilisers, which were until recent years used only to a slight extent in the Far East. Since 1952 their use has increased greatly in India, and Thailand, Malaya and the Philippines are now following India's example. However, fertilisers cost money, and one of the aims is to increase productivity per unit cost, with rice as with other crops. In some areas, especially in Southern India, green manuring provides a very much cheaper way of increasing yields. Where ample water is available, the green manure crop is grown first and ploughed in before the rice is transplanted. The cost of green manuring may be as low as one-tenth

that of artificials. Where the peasant growing rice is his own master, and labour costs are therefore not normally considered, green manuring is ideal for increased irrigated rice yields.

Mechanisation

In so far as mechanisation is concerned, there are still many problems to be solved before great advances can be made, even when the subject is taken to include the use of simple hand tools. In the Far East generally, many even of the simplest tools exist in a number of forms, often confined to quite small areas, in which knowledge of those used in nearby countries is lacking. The introduction of the best of such tools throughout the region is a step that can long precede mechanisation as understood in the more advanced parts of the world. The mechanical equipment already available needs to be tested much more thoroughly, under varying conditions and in different countries, and, as usual, there is a lack of personnel experienced in handling such equipment. In fact, large-scale mechanisation will not come quickly to the great rice-growing areas, especially when the prime need of keeping production costs down must be met at the same time.

Even more fundamental is knowledge of the plant–soil–water relationships on which successful rice culture depends. Here again a working party has been set up under the Commission. Work on this type of problem, however, is essentially of a long-term nature and any conclusions the group may come to are not likely to affect rice production in the immediate future.

The continued rapid growth in populations in the Far East, especially combined with the need to raise the diets of the vast majority of those populations, underlines the need to continue increasing rice production. Speaking not so long ago of the rice situation in the Far East, Dr. K. Ramiah, for many years head of the Cuttack research station, and still FAO's consultant on rice breeding, said that an overall rice surplus in this region was unlikely ever to occur and, in fact, one or two countries of the region could probably never be self-sufficient in rice. When, as in 1953, there had been a surplus in certain countries, this had been due to two really exceptional growing seasons and fine harvests. To emphasise what he meant he pointed out that in that year some of the unfertilised plots in fertiliser trial grounds not only produced twice their normal yield, but actually produced more than the fertilised plots did in a normal year. Although during the years of shortage of the war and immediate postwar period some people in the region changed their food habits to a certain extent, the number has not been enough to make any permanent difference to the situation. Rice production, therefore, remains the most important agricultural activity of a large proportion of the world's most densely populated regions and is likely to remain so far into the foreseeable future.

Rice-growing in Egypt. About 652,000 tons of rice was harvested in 1953

Black Pod in Nigeria

As part of the general drive by the Department of Agriculture to increase the production of oil-palm products of the Northern Region of Nigeria, All-Native Authorities in the Kabba Province have decided to establish oil-palm plantations, and to rent these to farmers once they have come into bearing. The oil-palm plantations started at Alade and Olla in Igalo Division in 1951 have come into bearing and are now opened ready for harvesting.

With the growing importance of cocoa in some parts of Kabba Province, the question of disease control is receiving concentrated attention. The Department of Agriculture has arranged tree-spraying demonstrations for the control of black pod.

The research carried out by the Department of Agriculture on fertiliser for yam crops will be put to trial by farmers for the first time this season. Farmers in Kabba Province will be using it on their yam crops and after the harvest will be asked to give their views on its value.

The Maize Rust Research Unit is investigating the possibilities of improving maize varieties grown in West Africa and has introduced and is testing a large number of maize varieties from other countries. Among these a variety called Mexico 1 appears to be very promising. Certain farmers throughout Kabba Province have been issued with this maize seed and have been asked to report on it after the harvest.

Factors Affecting the World's Food Supplies

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During the last war a group at Davis, California, and the U.S. Department of Agriculture were interested in the capacity of different plants and animals to produce food. In this article Prof. MacGillivray extends the same idea and deals with the procedures that could be used to increase our food supply.

MANY scientific disciplines are able to increase our knowledge of procedures that might be used to increase our food supply. There is always need for calling attention to all promising procedures so that they will receive proper consideration. This paper covers methods that are of general knowledge as well as those that are less known. With general world interest in food planning[1] aroused by increased population and decreased land area *per caput*, it seems desirable to list and discuss some of these neglected procedures.

Various aspects of the food supply problem are being studied: population trends, soil conservation, production practices and other factors. An article[1a] recently appeared considering the possibility that the U.S.A. would feed some 200 million people by 1977 and eventually be able to supply food to 1 billion (1,000 million) people. Most discussions of food supply are restricted entirely to consideration of land areas; only rarely are the potentials of water areas in producing food given much consideration.[2]

When food is considered from the standpoint of nutrient units per pound or acre rather than simply pounds of food, we have a sounder basis for considering how different procedures may increase food supply. The following items are important from the standpoint of producing a maximum food supply: (*a*) increase the area of land used for food production; (*b*) increase yield per acre by better agricultural practices; (*c*) increase nutrient production by selecting organisms (plants or animals) that can produce the greatest amount of nutrients per acre; (*d*) increase nutrient production by selection of organisms that will mature in a shorter growing season; (*e*) decrease waste of food on the farm and in marketing channels, even into the kitchen of the consumer; and (*f*) increase nutrient production by growing plants, where possible, for human consumption rather than for livestock feed. Many of the above considerations are doubtless equally applicable to food from water areas. It is unfortunate that knowledge on such areas has not received more attention.

The first two objectives are familiar to people interested in the subject of food production. Acreage may be increased by converting waste or marginal land in humid and arid areas to full production. Developing water resources is essential in the second case.

Yield per acre can be increased by many procedures: better cultural practices; developing more efficient varieties through selection or breeding; fertilising with nitrogen and with minerals in the soil as well as carbon dioxide gas in the air; improved irrigation; control of insects and diseases; and more general use of recent discoveries in scientific agriculture. The above items would include following sound soil-conservation practices and maintaining good physical condition of the soil. A continued period of high prices for farm products through support prices or other means seems to increase yields. Since the reward is greater, the farmer concentrates on more efficient agricultural practices. The remaining items listed above need more documentation.

Methods of computation

To increase our food supply, attention should be given to the species of organisms used in food production. At present we tend to compare different plants and animals on the basis of pounds produced per acre rather than on the important basis of total nutrients produced per acre. If nutrient comparisons are made, these are frequently limited to energy and proteins; only rarely are any of the minerals or the vitamins considered. In a systematic study made of 30 different vegetables,[3] in a typical example, it was found that sweet potatoes produced more of each of the nine essential nutrients (energy, protein, two minerals and five vitamins) per acre than did asparagus, cantaloupe, sweet corn, peas or watermelon. This is a rather severe test, since, with nine variables, many times a food is higher in eight or seven, but not in all nine. If the six most efficient vegetables are compared with the six least efficient, there is an overall average difference for the nine nutrients of 811%. The least and greatest percentage differences for the different nutrients are 210% for niacin and 1,507% for ascorbic acid. In another paper,[4] which considered all agricultural products, sweet potatoes produced more of each of the nine nutrients per acre than did apples, asparagus, broiler chickens, cantaloupe, fat cattle, cheese, cucumbers, eggs, fat lambs, oats, peaches, pork, turkeys, sweet corn, tomato, walnuts or watermelon. Some 85 different agricultural products were considered in this study. Sweet potatoes have been mentioned twice in these illustrations, but several other foods could have been used. When these comparisons were carried still further[5] there was evidence that vegetables

which furnish a vegetative part of the plant for food are more efficient in food production than fruit vegetables. The vegetative parts are root, stem, leaf or combinations of these; typical fruit vegetables are tomatoes, squash and snap beans. A number of vegetables (30) were arranged in four groups as to their efficiency as food products.[5] The two most efficient groups contained 61% of the vegetative and 8% of the fruit vegetables; the least efficient group contained 6% of the vegetative and 50% of the fruit vegetables.

Data developed by Shultis[6] also bear on this subject, but from a slightly different point of view. He compared six species of meat animals as to the pounds of total digestible nutrient required to produce 1 lb. of dressed meat. The following data give in general the pounds of digestible nutrients required to produce a pound of meat: (*a*) chicken fryer, 5.4 lb.; (*b*) rabbit, 5.4 lb.; (*c*) hog, 5.6 lb.; (*d*) turkey, 6.0 lb.; (*e*) steer, 19.9 lb.; and (*f*) fat lamb, 26.6 lb. The three studies cited above indicate that nutrient production per area will vary with species of animal or plant.

The growth period of each species affects the amount of nutrients that can be produced per acre per year. In much of the northern portions of the U.S.A. plant growth is impossible during the winter period. There is considerable land along the Gulf of Mexico and in the south-western part of the U.S.A., where growth is slowed in the winter, but production is still possible on a year-round basis. To plan our food picture accurately we must take into consideration the length of the growing season for plants and animals. Most tree fruits produce one crop per year and the land cannot be used for other food crops. This is usually true of grain crops because of a short growing season or lack of irrigation facilities in arid areas. With some vegetables and meat animals, several crops can be produced per year. With vegetables, for example, eight to 10 crops of radishes can be produced in a year in California, five crops of lettuce can be produced in the Salinas Valley in a two-year period and a crop of lettuce and cantaloupe can be produced on the same land in 12 months in the Imperial Valley. Shultis[6] gives the following periods for the production of meat animals: rabbits, 2 months; chicken fryers, 3.4 months; fat hogs and fat spring lambs, 6 months; turkeys, 9 months; and steers, 21 months. It is difficult to evaluate meat animals because sometimes their feed comes from crop land that may or may not be useful in producing foods for human beings. Many times a large portion of their food is otherwise useless by-products or from hilly or range land. In spite of this consideration, there is need to compare the production periods of plants and animals in any attempt at accurate planning for an increased food supply.

Spoilage and waste

Food losses on the farm, in marketing channels, and in the consumers' kitchens vary with the food and may be considerable. Waste is usually more serious with fruits and vegetables. The statement has been made[7] that one out of every 5 acres of perishable food is spoiled or wasted in some way. Food losses can be grouped into three general categories: (*a*) loss from spoilage or poor condition; (*b*) loss in weight; and (*c*) loss in food value.

Food supplies are increased when crops are consumed directly by people instead of being first converted into animal flesh. Animals use up feed in other ways than forming meat and the percentage of recovery of the different nutrients from the feed is not very large[8, 9] when the animal flesh is consumed. Most available data compare the efficiencies of different animals, but comparisons between plants and animals are also possible. Table 1 is an abstract of four tables appearing in Christensen's[4] Bulletin. The data are expressed in terms of days, which represent the National Research Council's daily requirement for each of the nine nutrients. These have been added in the last column and may be objectionable to some, since it may seem like the addition of dissimilar units. Each nutrient has been converted into a fraction of the daily requirement. This procedure is similar to a family budget, where the dollar cost of shelter, food, clothes and entertainment are added, although an article of food and a piece of clothing are not equivalent. This seems in both cases the best procedure for determining an overall evaluation.

The figures in Table 1 were developed from average farm yields of the U.S.A. for the period 1941–45. The different foods have been grouped according to the usual procedures of academic organisation. The different groups vary as to the amount of food nutrients—vegetables and some fresh fruits are high in vitamins, particularly vitamin A and ascorbic acid. The extreme example is carrots, whose vitamin content consists of 92% of

TABLE 1
PER-ACRE PRODUCTION OF FOOD IN TERMS OF DAILY NUTRIENT REQUIREMENTS OF MAN[4]

Type of product	*Value*	*Biological unit*	*No. of items*	*Food energy*	*Protein*	*Fat*	*Minerals*	*Vitamins*	*Av. for 10 nutrients*
				days	*days*	*days*	*days*	*days*	*days*
Dairy and meat	Greatest	Whole milk	1	108	236	245	722	784	210
	Average	—	11	64	139	204	237	461	111
	Least	Sheep	1	11	23	39	28	87	19
Grains and staple food crops	Greatest	Soya-bean, whole	1	521	2,224	1,078	4,240	4,796	1,286
	Average	—	17	653	673	197	1,353	1,933	481
	Least	Rye, flour	1	291	309	30	319	475	142
Vegetables, fresh	Greatest	Carrot	1	878	1,009	235	6,793	152,499	16,741
	Average	—	22	308	517	76	2,463	21,151	2,451
	Least	Sweet corn	1	187	274	84	286	2,591	342
Fruit, fresh	Greatest	Orange	1	769	582	131	3,421	35,768	4,067
	Average	—	13	493	267	286	1,346	12,284	1,469
	Least	Blueberry	1	92	34	32	348	1,388	189

The daily requirement of the National Research Council used in this table is: food energy 3,000 calories, protein 70 g., calcium 80[illegible], iron 12 mg., vitamin A 5,000 i.u., thiamine 1.5 mg., riboflavin 2.0 mg., niacin 15 mg., and ascorbic acid 75 mg. No recommended allowance is given for fat, but it is considered desirable that 20 to 25% of the food energy be in this form. This is the basis for the recommendation of 67 g. used here.

TABLE 2
RELATION OF RETAIL COST, NUTRIENT UNITS PER POUND, AND COST PER NUTRIENT UNIT FOR THREE OF THE SEVEN BASIC FOOD GROUPS[12]

Group 3				*Group 4*				*Group 5*			
Food	*Cents per pound*	*Nutrient units,*		*Food*	*Cents per pound*	*Nutrient units,*		*Food*	*Cents per pound*	*Nutrient units,*	
		per pound	*cents per unit*			*per pound*	*cents per unit*			*per pound*	*cents per unit*
Dried apricots . .	60	10.1	5.9	Milk, whole . .	10½	1.7	6.2	Round steak . .	85	3.3	25.8
Dried peaches . .	50	7.0	7.1	Dried, skim milk	32	15.6	2.1	Rump	71	3.3	21.5
Dried prunes . .	30	3.3	9.1	Evaporated milk . .	16	3.3	4.8	Chuck	41	3.1	13.2
Dried raisins . .	22	1.8	12.2	Cheddar cheese . .	55	7.0	7.8	Hamburger . .	33	3.3	10.0

vitamin A. White and sweet potatoes have been included with the vegetables.

Table 1 indicates that the plant group has the highest average and thus is a more efficient producer of nutrients per acre than any animal group. Fat has also been included, although no daily requirement has been published by the National Research Council. In this case animals produced more than any plant group except fruits, which include the avocado, high in fat content. Perhaps some mention should be made concerning the nutritional value of amino-acids from animal and plant sources. Some nutritionists feel that for optimum nutrition half or more of the total protein consumed should be of high quality or from animal sources.[10] An amino-acid is considered essential regardless of its source, whether plant or animal.[11] It is conceivable that a diet, completely balanced in amino-acids, could be constructed solely from plant sources.

The land used in Table 1 is an average for the U.S.A. and it is likely that the different groups of products were grown on land varying in productivity. The final test will need to be made where all products are produced on equally productive land. Some animal feed comes from less-productive areas that could produce only small yields of crops for human food. Other data[8] indicate that swine and dairy cows can convert 14.5% of feed protein to edible protein, and lambs can convert only 4.4%.

The above discussion suggests that there should be some change in eating habits for greater efficiency in land use. Human food preferences cannot be ignored and, further, food choice, regardless of preference, will be affected by prices. When food is supplied without cost choice is different than when cost is reasonable or excessive. In addition, food acceptance is a much less important factor when food intake falls below subsistence levels. Any change in our diet would probably be gradual, as in an important change over the last 25 years—a decrease in the use of white potatoes and an increase in the consumption of other vegetables.

Nutrient basis

Since cost is an important factor, there is merit in the suggestion that food be purchased on the basis of nutrient content. Unfortunately, our knowledge is not complete and choice must be made on a broad basis—among each of seven basic groups of foods.[12] Since the foods in each group are interchangeable, it is possible to make comparisons as to cost per nutrient within a group. This has been done briefly in Table 2. Prices were obtained at a local store. The comparison between different dried fruits shows that dried apricots with the highest cost per pound possesses the least cost per nutrient unit. In the case of meat, hamburger with the smallest cost per pound also has the smallest cost per nutrient unit. This illustrates that the price of food is based on cost of production, marketing costs and supply and demand with little regard for nutrient content.

Besides land, other factors important in efficient food - production programmes are such items as labour, equipment, fertilisers, pesticides and irrigation water. Although the above discussion does not cover these materials, they are discussed in several of the references.[3, 4, 13–17]

Times of stress are usually poor times for accurate planning for our food needs. It seems better that plans should be developed slowly for greater accuracy. As indicated, there are numerous ways of increasing the potential output of our food supply. We will likely need to be satisfied with gradual improvement by several methods rather than achieving complete efficiency in all ways in a short time. No consideration has been given here to how transportation facilities or economic status of consumers affect food supply. Many procedures have been mentioned that may be used to increase food supply. If each would increase our food 10 to 15%, the result would be enormous.

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Changes in the Structure of West German Agriculture

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Germany has seen great transitions in the structure of her agricultural holdings since 1882. By taking the year 1925 as the turning point in these developments the author is able to show clearly that the nature of the agricultural holdings has changed sharply. The total area of holdings up to 5 ha. has shrunk, whereas the total area of holdings of over 10 ha. has increased. Dr. Riemann discusses the reasons for this and notes the effects of advancing industrialisation.

IN all countries the change-over to an industrialised economy has brought in its wake a far-reaching change in the structure of agricultural holdings. In West Germany this can be seen from the figures of the agricultural census for the years between 1882 and 1949. During that period there has been an appreciable redistribution of the groups of farms of various sizes and of the acreage farmed by them (see Tables 1 and 2).

On an average the year 1925 may be taken to represent the turning point in this development. Before 1925 holdings of less than 10 ha. were able to expand their acreage, whereas farms of 20 ha. and over showed a loss of overall acreage. This trend was reversed after 1925. The acreage of smaller holdings up to 5 ha. shrunk; those over 10 ha. expanded. Up to 1933 holdings of 5–10 ha. were able to add to their acreage, but after that date they were absorbed by the tide of industrialisation, and they have been in a state of stagnation ever since. After the second world war political influences (*e.g.* land reform) accounted for the actual loss in acreage which was suffered by the larger farms of 50 ha. and over. A redistribution of holdings of various sizes has since taken place; at the same time, the acreage farmed has undergone a change and the apparent increase in the total agricultural acreage is solely due to such measures as soil reclamation etc.

A comparison of the figures given for the different regions confirms our assumption that this trend is entirely caused by advancing industrialisation. In the industrial key areas on the Rhine and Ruhr, and around Brunswick, the number of holdings of less than 5 ha. has been on the wane since 1882. In the governmental district of Düsseldorf only half the 1882 small-holdings were still in existence in 1949. In less industrialised governmental districts, such as Lower Bavaria, Cassel and Trier, on the other hand, the number of such small-holdings has not decreased since 1949; in some districts it has even been augmented. In the Cassel governmental district this increase amounts to as much as 60%; in other districts we have witnessed a decrease since 1925.

Obviously we have to distinguish between three different types of regions. In industrial key areas small-holdings have been vanishing for a very long time and this development now affects holdings of up to 10 ha. In areas of retarded industrialisation and in the countryside surrounding them the downward trend made itself felt at a much later stage and has so far been confined to holdings of less than 5 ha. In remote and under-developed agricultural districts there has even been a reverse of this trend, which is still continuing. Owing to the overcrowding of such districts, we are even faced with a new splitting-up of existing small-holdings.

The increasing productivity of human labour in industry has resulted in constantly rising wages for workers.

Small, narrow lots require unproductive human labour. Peasant families harvesting corn in Hessen

As opposed to this, agricultural small-holdings which have still to rely solely on human and animal labour are under a hopeless handicap. Children of farmers who live near industrial centres have, therefore, in many cases abandoned farming for what to them seemed the glittering prizes of industrial employment. To a large extent small-holdings have become a kind of spare-time occupation for people who earn their daily bread elsewhere. Their family income mainly derives from industrial earnings or from pensions to which, as industrial workers, they have become entitled.

Ploughing with oxen is not conducive to productive use of the peasant labour force. The illustration shows a small-holder (husband-and-wife team) with oxen in Hessen

Transition

The transition from farming to industrial work is usually effected as one generation hands over to the next. The farmers' children are usually the first to leave the land. When their time comes to take over the farm and to till the soil they usually continue as industrial workers and cultivate the soil in their spare time and as a sideline, usually in order to add to their income in this way. Even so, industrial employment has become so highly remunerative that quite a few small-holders prefer to earn that extra money by working overtime in industry. As a result, they either give up their land altogether, or they split it up in order to be able to cope with the amount of hard work involved. Technical improvements, which on the whole have greatly increased agricultural efficiency, are too costly to be of any use to small-holders and to provide them with an income from farming which would compare favourably with their industrial earnings.

It follows that, as a source of income and employment for a whole family, agricultural small-holdings are continuously losing ground, particularly in areas where it is easy to switch over to alternative employment and where, owing to the propinquity of agricultural and industrial establishments, the relative incomes can easily be compared. As the industrial areas expand, the small-holdings contract in number and size. This development might easily have had very undesirable sociological consequences by depopulating the countryside and concentrating the population in a few large industrial towns. Fortunately, any such tendency is counteracted by the way in which the population is distributed over West Germany. There are, it is true, a few areas of industrial concentration, but on the whole we find a vast network of small and medium-sized towns, where industries have been established and where there are many possibilities of employment outside agriculture. In consequence, many small-holders have been able to continue living in the country while abandoning farming altogether, or at least drastically restricting their agricultural commitments. This has happened frequently, so that even at this point we can safely say that about half the German population have not severed their ties to the soil.

TABLE 1
AGRICULTURAL ACREAGE OF FARMS OF VARIOUS SIZES
(Thousands of ha.) (Percentages in parentheses; 1925 equals 100%)*

Year	*2–5 ha.*	*5–10 ha.*	*10–20 ha.*	*20–50 ha.*	*more than 50 ha.*
1882 ..	1,960 (95)	2,307 (91)	2,871 (100)	3,316 (126)	1,661 (128)
1925 ..	2,050 (100)	2,616 (100)	2,873 (100)	2,628 (100)	1,298 (100)
1933 ..	1,030 (94)	2,813 (108)	3,221 (112)	3,125 (119)	1,546 (119)
1949 ..	1,800 (98)	2,840 (109)	3,516 (123)	3,262 (124)	1,380 (106)

* Compiled from L. Gatz, 'Changes of Farm Sizes in the Federal Republic from 1882 to 1949' (MS.), Goettingen, 1954.

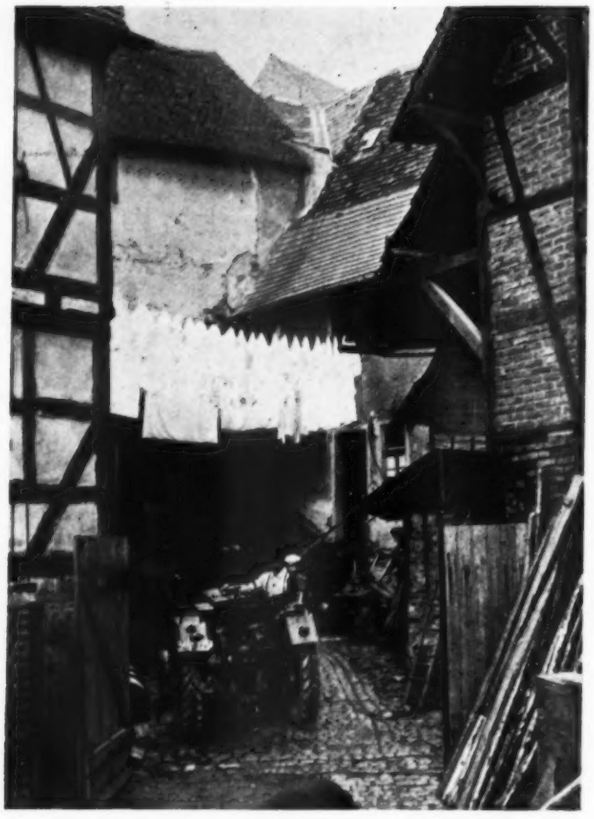
TABLE 2
NUMBER OF AGRICULTURAL HOLDINGS FOR EACH GROUP OF FARMS
(Thousands of ha.) (Percentages in parentheses; 1925 equals 100%)*

Year	*2–5 ha.*	*5–10 ha.*	*10–20 ha.*	*20–50 ha.*	*more than 50 ha.*
1882 ..	601 (96)	330 (87)	205 (99)	113 (123)	19 (148)
1925 ..	629 (100)	377 (100)	208 (100)	92 (100)	14 (100)
1933 ..	586 (93)	402 (106)	233 (112)	108 (118)	17 (121)
1949 ..	544 (87)	401 (106)	255 (123)	112 (123)	16 (114)

* Same source as Table 1.

Living standards

Should attempts to attract industry to depressed agricultural areas of the hillside districts prove successful, it will be possible for the population of these districts to achieve adequate living standards by adding to their income from industrial wages. Therefore the change in size of agricultural holdings during the last few decades should be welcomed. We are witnessing here the adaptation of the structure of agricultural holdings to the changing conditions of an industrialised economy and society. Eventually this will result in the rationalisation of the whole



The small yard and obstructions make difficult the work that has to be carried out in the yard and the stables. This is the yard of an 18-ha. small-holding in Hessen

agricultural economy. In some areas it has already been successfully concluded and we are even now confronted with an entirely reorganised agricultural community.

Large-sized gardens

In accordance with varying economic and climatic conditions, the family small-holdings have already found a new level at between 5 and 15 ha. On the average it is around 7.5 ha., *i.e.* considerably higher (up to as much as 50%) than before the start of the redistribution of farm groups. In addition, we find a large number of families living in the country who have kept up farming as a sideline. The size of their holdings depends on the size and general mentality of the individual family and on the main occupation of the husband and father. There are a number of occupations which can easily be combined with farming—either because they entail seasonal employment, or because they result in invalidity at a comparatively early age (*e.g.* in mining), and there are occupations where such conditions do not apply. On the average these spare-time holdings are about 1 ha. in size. There is another section of the farming population who no longer farm the soil, but who have started to cultivate large-sized gardens.

Government scheme

Land which has thus become available is used to increase the holdings of farmers who have decided to stick to full-time farming, but whose present holdings are inadequate to secure a decent standard of living for the whole family. The Federal Government has inaugurated a scheme for the benefit of West German agriculture with a view to assisting small-holders of this type. It is not intended to stem the tide, but to accelerate it and direct it into the right channels. In view of the topographical and economic propinquity of agriculture and industry, it is not restricted to agriculture. It affects the whole national economy, as it is ultimately intended to establish for the greatest possible part of the Federal Republic a sound economy which is many-sided and well equipped to resist economic fluctuations and depressions.

Translated by Margot Pottlitzer.

Photos: M. Merforth, Goettingen

Propagation by Hardwood Cuttings

The raising of fruit-tree rootstocks by hardwood cuttings was the subject of a Members' Day at East Malling Research Station (near Maidstone, Kent, England) on 5 June, 1956. Mr. R. J. Garner, introducing the day's programme, pointed out the advantages of hardwood cuttings over layers, for not only could production easily be changed to suit variations in demand, but they required only relatively unskilled labour. He then showed a number of rootstock hedges, stressing that these produced very large numbers of shoots that made excellent cuttings and were eligible for Ministry certificates of trueness to name. The successful rooting of cuttings depended largely on their survival, and the observation that better rooting followed a mild autumn had led to winter storage of the cuttings in warmer conditions in insulated bins, with remarkably successful results.

Dr. E. S. J. Hatcher discussed the importance of storage temperature and showed, in the field, the growth of cuttings that had received various treatments; some of these had given a very high percentage of rooting. He also showed that quite a range of rootstocks could be propagated in this way. He later described, with the aid of an exhibit, the principles underlying the methods advocated.

A visit was made to the station's nursery, where Mr. J. Byford showed the visitors tens of thousands of rootstocks grown from stored cuttings.

Irrigation in frames

Newly constructed frames, fitted for automatically controlled mist irrigation, were shown by Dr. W. S. Rogers. These were being used for softwood cuttings and, although they had been in use for little more than a month, many of the cuttings had rooted and were being hardened off. This method might prove useful for rapid multiplication of new and valuable material. Dr. S. M. Singh, Professor of Horticulture at the University of Agra, India, who is spending a year at East Malling, described in detail the working of the equipment, of which he had taken charge, and discussed the particular problems being investigated.

Precision Surface Drainage for Sugar-cane Land

IRWIN L. SAVESON
(*U.S. Department of Agriculture*)

An improved system of surface drainage for sugar-cane lands is emerging from research conducted by the U.S. Department of Agriculture and the Louisiana Agricultural Experiment Station. The system involves smooth and precise grading to fill all pockets and depressions. This permits elimination of most of the troublesome quarter or field drains and, at the same time, more effectively removes the excess water. Final benefits are lower-cost drainage and higher sugar yields.

LOUISIANA cane lands, where this research was conducted, has about 60 in. of rainfall per year. Large amounts fall in short periods. The soil is impermeable and its surface is full of scars and depressions which impound water. All of these lead to a very critical drainage situation.

Old system

The old system for obtaining drainage has been to construct hoe- or quarter-drains to carry the water from low spots and row-middles to lateral ditches, which in turn empty into outlet canals. This system is proving inadequate for several reasons: (1) It requires considerable hand maintenance, (2) the system interferes with the use of modern, high-speed farm machinery, and (3) it fails to remove the various depressions which impound water or the soil or spoil barriers which impede surface water movement.

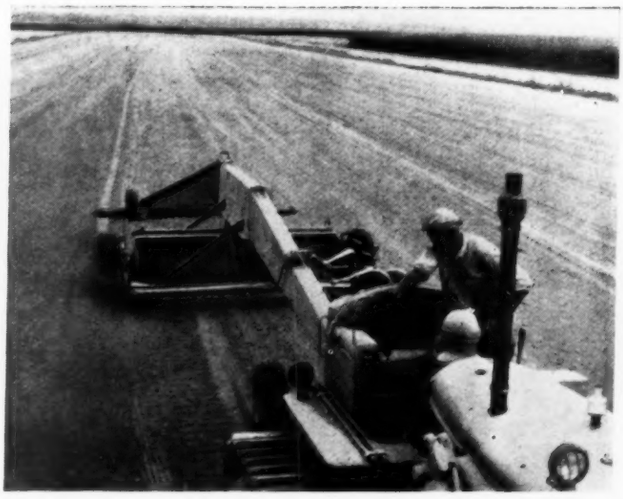
The improved system retains the lateral ditches of the old system, but reduces the quarter-drains or field drains to mere openings through the rows. There are no deep channels across the middles where the tractor wheels run. The soil is redistributed so that the natural slope of the cut (the area between two lateral ditches and two access roads or headlands)* is from the centre to the edges, where the lateral ditches are located.

Grading

Grading is the first step towards preparing the land. By using a bulldozer or scraper, soil is moved from the headlands and spoil banks and placed in the low spots. When completed, the field has a slight crown in the centre, running from lateral ditch to lateral ditch. It is similar to the crown on highways. The cut is sloped from the crown to the edge so that excess water will run into the lateral drains instead of collecting in low spots. This is sometimes referred to as ' turtle-backing '.

Grades obtained with a motor grader or a bulldozer alone were not sufficiently precise to remove many of the depressions that reduced yield. During the growing season every ponded area or pocket was in evidence; the cane was less vigorous and the stand was sparse. For example, when 10% of the area was ponded 2 in. or deeper cane yields were reduced 2.7 field tons per acre; 50% ponding reduced yields 4.6 field tons per acre.

* A cut is approximately 100–250 ft. wide and 1,000 ft. long.



(Left) *A sparse stand of sugar-cane in a depression which is inadequately drained.* (Right) *Establishing the final grade on a sugar-cane cut with a land leveller after it has been formed and smoothed with other machines*

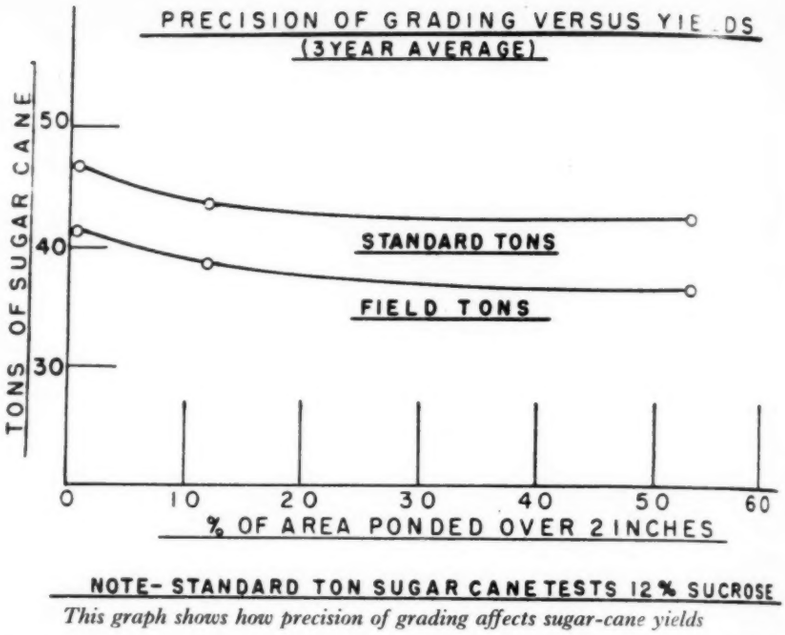
But although precision smoothing is a major requirement for success it is also important that the earth-moving cost per acre be kept low through careful selection and operation of equipment.

Equipment

A wide choice of equipment is available for use in grading land—ploughs, bulldozers, motor graders, scrapers, terracers and drags. Field trials on test cuts have shown that each type has both advantages and limitations. Tests also show that the success of any one type of machine is dependent upon the method of operation and the skill of the operator.

In experimental work a scraper with the capacity of from 4 to 6 cu. yd., either two- or four-wheeled, and pulled by a medium-sized crawler tractor, has proved to be more usable for rough grading than any other machine tested.

In some cases combinations of equipment may be used in order to expedite the grading work. The most common is a bulldozer-scraper combination. The 'dozer is used to move the earth through distances up to 300 ft.; the scraper is used to transport it over the longer distances. These are the most economical zones in which to use the machines when they are used together if the cost of grading and forming the land is to be kept at a minimum. The bulldozer may also be used in combination with a motor grader. The motor grader is used to cut down headlands and spoil banks, moving the soil to a position where the bulldozer can easily get behind it to spread it into the low spots of the cut. The cutting can be done more easily with the grader and the spreading can be done more rapidly with the bulldozer. No fixed zones of most economical operation have been established for these machines when they are used together.



This graph shows how precision of grading affects sugar-cane yields

Levelling

After the rough grading is done a floating-type land leveller is used to do the precision grading. This implement, used in arid regions to prepare land for irrigation, is too often looked upon as a major earth-moving tool. It should be used only as a finishing tool to smooth and correct small discrepancies in grade that are beyond the range of conventional earth-moving equipment. For example, the bulldozer and scraper may be used to bring the land to within 2 in. of final grade and then the leveller is used to bring it to an exact grade and slope.

For the most precise work the longest machine that can be fitted to the available power and field size should be used. The most applicable machine found for levelling Louisiana sugar-cane land is the floating-type leveller with a hinged frame. The floating feature allows the machine to jump ditches and the hinged frame facilitates its use in small areas such as sugar-cane cuts.

Care must be taken not to do grading and levelling work when the soil

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From a ditch excavation spoil bank a scraper picks up soil to be used to fill depressions as the field is formed

New Methods for Testing Viability of Seeds

MENKO PLAUT and ORA HELLER-COHEN

In this note the authors draw attention to important procedures for checking the viability of seeds. They discuss the selenite and tetrazolium techniques and discuss a new method, using resazurin, which was developed in Rehovot and which appears to overcome some of the disadvantages inherent in other methods.*

NOBBE, whose classical work on seed-testing appeared in 1872, established seed-testing as a new branch of science. Extensive research followed and defined conditions are now agreed for testing germination and viability of the most important agricultural seeds. Though the determination by germination tests is reliable, they are time-consuming. The viability or vigour test requires 6–10 days and for seeds with a dormancy period before germination, especially those of some legumes and trees, the test may take several months.

At the beginning of this century research workers had experimented with biochemical methods for testing the viability of seeds by using enzymic activity of viable seeds, by an oxidation or reduction test, changing the colour of indicators, or by using chemicals giving different colour reactions for viable and non-viable seeds.

In recent years, owing to the introduction of these new techniques, the International Seed Testing Association at Congresses in Washington in 1950 and in Dublin in 1953 elected committee members to examine specific problems of biochemical tests.

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Ora Heller-Cohen, Agronomist, College of Agriculture, Hebrew University.

The selenite method

This method was first used in Japan for seed of forest trees and involves the reduction of selenium salts. Plaut and Gabrielit-Gelmond[1] were the first to employ this method for testing vegetable seed. Their report also contained a review of methods tried up to that time (' International Seed Testing ', 1948, Vol. 14, No. 2, Copenhagen, p. 190).

The tetrazolium method

This method was developed by Lakon Hohenheim in 1944, who named it the topographical staining method. Before applying the dye the seed is bisected longitudinally so that the germ is cut in two and all its parts can be observed. If the vital parts dye red the seed is considered viable. Other research workers also investigated the Lakon Hohenheim method or a modification of it and the method was officially accepted in Germany as an ancillary test for some cereals. Ivar Gadd, of Copenhagen, who was chairman of the special tests committee, rejected this method for seed treated with fungicides, as the results were not sufficiently comparable to those of the standard method when the seed had a moderate germination capacity.

Sorgen-Domennigg, Guendet and Geddes[2] have investigated the correlations of three methods for testing damaged wheat seeds:

(*a*) The formazan - tetrazolium method.

(*b*) The fluorescence method.

(*c*) Fat-acidity-of-grain method.

They found that the result of germ damage and viability cannot be accurately estimated from the formazan value or fluorescence; however, viability is highly correlated with fat acidity.

The shortcomings of the formazan (TTZ) and selen methods are:

(*a*) Treatment kills the seed so that it is not possible to make a direct check by a direct and subsequent germination test.

(*b*) The selenium method is objectionable because of the formation of a poisonous gas during the test.

(*c*) The tetrazolium method gives only good results for seeds whose germination is above 70–80% (or very low).

The resazurin method

This new method for seed-testing, developed in Rehovot, would appear partly to avoid the disadvantages of the other methods. The finding of new ways for assessing quickly the viability of seed is important and new methods

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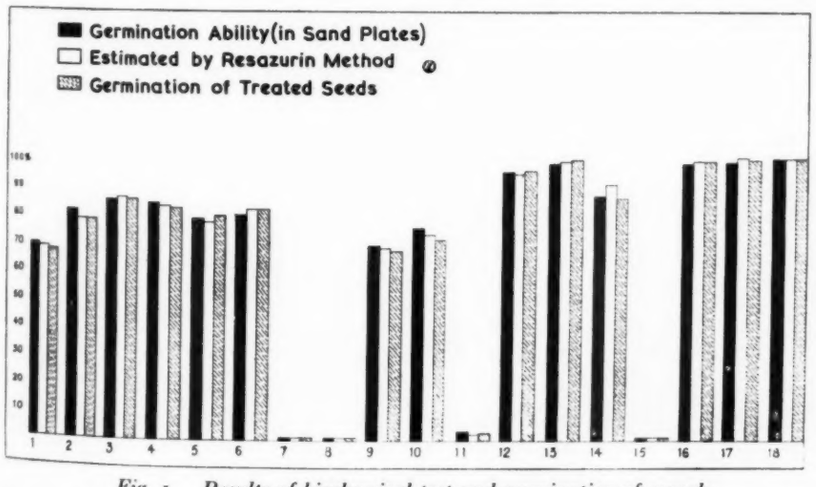

Fig. 1. Results of biochemical test and germination of cereals

Nos. 1, 3, 4, 8, 9 : wheat (*vulgare* varieties)
Nos. 2, 5, 6, 7 : wheat (*durum* varieties)
Nos. 10, 11 : rye
Nos. 12, 13, 14, 15 : local oats varieties
Nos. 16, 17, 18 : barley varieties

To Make the Pastures Green

The Story of a One-man Mission in Thailand

The material published below is an account of a retired Indian irrigation agronomist, Prof. M. R. Balakrishnan, who was recalled from his retirement by FAO to assist farmers in Thailand to improve their economy. He is doing this by demonstrating that Thailand need not be a one-crop agricultural community, but that, by utilising the earth properly, crops such as sugar-cane, peanuts, cotton and jute can be grown as second crops on rice land. This information was obtained in the first instance by a UN radio reporter.

ABOUT 160 km. to the north and west of Bangkok, capital of Thailand, surrounded by charred and smoking rice paddies, one patch of land stands out as an oasis of lush green vegetation. It is only a few acres in size, but in contrast with the desolation all around, sugar-cane, already 10 ft. high, corn, thick cotton plants, peanuts, soya beans, jute and sorghum all grow there.

This is largely due to the work of one man, and his small staff of assistants, and in time it may change the face of Thailand. On the map the place is called Samchook.

To reach Samchook you leave Bangkok at 7 o'clock in the morning, before the burning sun rises high over the land. Your station wagon bears the insignia of the Royal Irrigation Department. Its passengers include your guide, Mr. Charin, of the R.I.D., and two of his colleagues who tend the irrigation regulators along the Supon River.

Some three and a half to four hours later you arrive at Pho Phya, where an irrigation station controls the regulator on the Supon River. Your guide invites you into the station rest house, introduces you around, and automatically the hospitable Thai bring out refreshments.

Then begins the most fascinating part of the journey. Your guide leads you down the banks of the Supon, to the side of the navigation lock, and into a waiting speed boat. The gear is stowed and then you set off upstream toward Samchook.

For two hours, on the Supon, you think you are living in a moving picture. The river is surrounded by jungle. Colourful birds swoop across as you pass. You round a bend in the river and a village on stilts appears, all of whose inhabitants seem to live mostly in the water or on it.

Tropical vegetation

The primitive settlements alternate with dense jungle. Along the banks you see the curious forms of the kapok tree, mingling with the majestic mango, long-needled pines of a local variety and palms. Occasionally a temple comes into view, with mosaic tiles and pagoda-shaped roof.

Finally you emerge into open country again, at a new regulator. This is Samchook.

Another rest house, this one belonging to the Royal Irrigation Department. You are presented to the staff and welcome refreshments flow once more. A room is put at your disposal for the night. Later you set out on foot to your destination, the Samchook Irrigation Agronomy Farm.

You have heard, of course, of Prof. M. R. Balakrishnan and he has been informed by radio of your coming. But you are unprepared for the manner of man he is.

As you walk with Mr. Charin along the embankment, beside the irrigation canal which parallels the Supon River, someone hails you. You turn and see a tall, erect Indian. Prof. Balakrishnan strides toward you, holding out a bamboo cane, not because he needs it, but because it is calibrated in centimetres to measure the depth of water in the fields and ditches.

The introductions are soon over and you find that here is a man who retired some years ago from Government service in his native India. But he did not retire simply to green pastures. He retired to a new and demanding job whose aim is, indeed, to make the pastures green.

In order to obtain a small quantity of rice for sampling purposes trainees watch farmer threshing with his feet, a simple and quick method

Prof. Balakrishnan is an irrigation agronomist. He is running an experimental farm at Samchook because FAO found in him the right man to do a job requested by the Thai Government. You ask what that job is.

' Well ', began the Professor, ' Thailand is a country of monoculture—rice '. And he explained that the Thai farmers spend some three to four months raising a crop of rice during the rainy season, then retire and ' go to sleep ' for the rest of the year. What is more, he said, their rice is no longer of the high quality of some years back.

New crops

His job is to introduce, into the same fields and paddies in which the farmers grow their rice, other crops which will grow after the rice is harvested, without interfering with the principal crop. He is also out to find improved strains of rice which will grow in this area—the ' Rice Bowl ' of Thailand—so that the entire economy of the country and its people will prosper.

Prof. Balakrishnan leads you briskly along the ridges between the fields. He points out the peanuts, the cotton, the jute. He shows you with pride the maize and the sugar-cane. He tells you he has had such success in growing sugar-cane that a new factory is being built to refine the sugar which will be developed locally, and which will save Thailand from having to import huge quantities of sugar each year from abroad. He tells you how the corn, though not generally used for human consumption in Thailand, can be processed industrially and used to make many products needed by the country.

He tells you, too, about the few score young Thai lads who have been sent to him by the Government and by the new sugar factory so that they may learn to visit the farms and teach the farmers how to grow their cane.

Teaching by example

The Professor believes in the value of practical demonstration. He shows you one field whose cane is sparse and scrawny, grown by local methods. Nearby is another field where ' the cane is more than 8 ft. tall, and the sugar it produces is double the local average '. ' This is what teaches the farmers, when they see the difference ', he says.

The selected paddy field is carefully measured by the trainees, under the supervision of FAO instructors. This is the first step in estimating the yield of the field

Here, then, is a one-man agricultural and industrial revolution. When the Government spreads his practices among the farmers of Thailand each field, fallow now for almost eight months each year, will produce a new yield every few months. That means more money for the farmers. Then there is the sugar factory. It will not only employ many people almost all the year round, but will help the economy of the country. So, also, will the factories needed to process the peanuts into oil and the corn into starch for sizing and other purposes, and the cotton and the jute if the experiments show that these can be grown.

Jute—a rice-growing country like Thailand needs millions of gunny sacks in which to transport its rice. These it must now import. But if jute can be grown there, think of the savings in foreign exchange. Not to mention the jobs in factories weaving the sacks.

One thinks again of the charred fields all around Samchook. And you hear the Professor explain that the Thai farmers burn the rice straw after the grains are harvested. ' Why ', he says, ' they don't even give it to their cattle, or plough it under, thus enriching the soil. Instead, they burn it up, wasting the good nutriment in smoke in the sky instead of putting it back in the land '.

' My dream ', he says, ' is to see, as the result of my work at Samchook, an emerald green covering the entire country, almost 12 months in the year. Surely it will require more work by the farmer, but it will be worth his while. That is my dream! No more burning fields, but green all over this good earth '.

Russia Joins Plant Protection Convention

Norway and the U.S.S.R. have joined with 45 other countries in a co-operative effort to fight plant pests and diseases which cause losses amounting to billions of dollars each year. FAO has announced that Norway, on 23 April, and the U.S.S.R., on 24 April, deposited instruments of adherence to the International Plant Protection Convention.

The Convention, approved by the FAO Conference in 1951, came into force on 3 April, 1952, with 37 signatories. Since that time 10 other countries have notified FAO that they will adhere to it.

The Convention requires all contracting governments to adopt effective and uniform quarantine measures to prevent the spread of destructive plant pests and diseases and to organise international campaigns to combat outbreaks which threaten more than one country. It also requires them to establish or improve their national plant-protection organisations up to a standard capable of discharging the responsibilities specified in the Convention.

Soviet Agriculture

Official Urge for Increased Production

W. G. CASS

The most outstanding agricultural news to come out of Russia in the past few weeks was the announcement, through the official Soviet news agency Tass, that Prof. Lysenko has been relieved of his duties as president of the All-Union Academy of Agricultural Sciences. The move was made at his own request! The move to break Lysenko's ' monopoly ' in genetics and agricultural sciences appears to be part of a general trend to loosen the hold of dogma and orthodoxy where these have been crippling progress. In this article Mr. Cass reports on various aspects of Soviet agriculture.

AFTER most plenary sessions of the Central Committee of the Communist Party (TsK., K.P.S.S.) there is usually a plethora of articles in the technical press highly commending the progress made in most industries, but at the same time deploring the many defects that yet remain; a curious blend of laudation and censure, based on these plenary discussions. Agriculture is no exception—in fact, it takes a leading place in this respect—and both after the January and July sessions of 1955 there were numerous exhortations to greater effort in all departments.

A notable example is a long article by the Deputy Minister of Agriculture, V. Matskevich, in a recent issue of the journal of the Ministry, *Sotsial. Sel. Khoz.* Highlights in his discourse are the many weaknesses of the M.T.S. (machine and tractor service stations)—now employing more than 2 million persons—on the one hand, and the wonderful merits of the maize crop on the other.

His main theme is the more vigorous development of output, concerning which many fundamental suggestions, and some caustic comments, were put forward by the TsK. Much of this related to livestock, to the feeding of which a large part of Soviet arable farming is, of course, devoted. Not only have the needs in this direction multiplied, but the demands of an increasing urban and industrial population, aiming at a higher standard of living, for building up food reserves by the State, for industrial raw materials, and also for fostering export trade, have advanced prodigiously of late.

Newly cultivated lands

Beginning first with some creditable achievements, reference is made to the vast areas of virgin and waste land that have been brought under cultivation. In the 1954–55 season this amounted to 17.6 million ha., exceeding the planned programme by more than 4 million ha. Despite unfavourable climatic conditions in many parts of the Union, the output in 1954 of wheat, potatoes, barley, meat, oil and other products exceeded that of 1953, in some cases by a heavy margin, *e.g.* cereal production is said to have exceeded that year by no less than 271 million poods (4.6 million tons). Even the M.T.S. are, to begin with, commended for some good work, and so far as the collective farms are concerned, they did excellent service in some cases. ' Conversion to tillage ' was 75 million ha. greater than in 1953; winter sowings exceeded plan (a common experience); frosty or winter tillage was 12 million ha. more; and the area cultivated by the new Mal'tsev system was considerably enlarged.

Yet the production of cereals and of livestock remains far below the needs of the increasing population, and at this stage the author presents a lengthy criticism of the M.T.S. as largely responsible for this state of affairs, with their inefficient ' official and bureaucratic methods ' and, in many cases, poor management. More specifically he complains that the tractors and other machinery are often worked by inexperienced and incompetent operators, and several of the stations are poorly managed by academic specialists—agronomists, zootechnicians etc.

Increased production required

The need for increased all-round production is again emphasised—from the point of view of foreign trade, for the provision of 4,000 million poods (64.5 million tons) of grain for livestock, and also large amounts of bran and pollards, oilmeal and cake and various compound feeds. This means, among other things, special attention must be paid to oleaginous crops, such as sunflower etc. But these are hardly mentioned in the present review. Obviously one of the most important tasks is increased productivity of all crops in all parts of the Union, and for this there are still very wide possibilities. Apart from some leading collective and State farms, producing large crops of cereals every year, including forage, there are many with poor yields. This must be remedied by every possible means, some of which are indicated.

Some results shown at the All-Union Agricultural Exhibition (Moscow) illustrate the possibilities, described as enormous by the author. At this exhibition, both in 1954 and 1955, farms were represented yielding an average of 25–30 or more centners ($2\frac{1}{2}$–3 tons) per ha., or roughly a ton or more per acre. By way of example is named the Altai country, in some parts of which grain crops represent 75% of total acreage. Here they use the so-called

crossed and ' narrow series ' methods of sowing best quality seed, snow retention, hot-air warming of seed grain, treatment with phosphorus bacteria, spring harrowing, early growth etc. As an example from the southern regions of the Union the Korenovsk locality of Krasnodarsk is mentioned, though the yields here appear to be much lower (18.5 centners per ha. on average for 41,000 ha.).

Fertilisers

Some reference is made to the use of fertilisers that are of particular importance in the cultivation of cotton, sugar-beet, tobacco, flax and the like and in zones outside the black-earth belt. If all winter-sown crops could have early spring applications of fertiliser, the author considers that this alone, for the whole country, would increase yields by not less than 300–400 million poods per annum. The use of mineral fertilisers with sugar-beet, for example, even in comparatively small amounts, gives an average increase of 60–80 centners per ha. Although the manufacture of mineral fertilisers in the Soviet Union is said to be continually on the upgrade, there is much to be said for the better use, both by M.T.S. and collective farms, of local materials. Serious losses, too, are often made through protracted delays in getting in the harvest; one-fourth or more is lost in this way. This point was considered in some detail at the session of the Central Committee. Clearly more machinery is needed, and it must be more skilfully used and maintained.

Maize cultivation

Coming now to the important question of maize cultivation, to which the author devotes several pages of his report, it was again emphasised by the Central Committee that this crop alone serves two ends: grain and silage (though, surely, there are other two-purpose crops). By 1960 it is planned that the grain yield (fodder or Russian *korm*) shall be not less than 65 million tons, and silage 176 million tons, root crops and the like 38 million tons, potatoes 25 million tons, and coarse feedstuffs (roughage) up to 178 million tons. Only concentrates are apparently omitted from, or are of less account in, these ambitious plans.

Maize is regarded as the most important from a forage point of view. Special attention has lately been given to more mechanisation in its culture and harvesting, as well as to improved silage methods. Some details are given of the stock-feeding value of maize and products, its resistance to drought and other climatic severities, hybridisation, extension of culture northwards etc. In some favourable parts of the country —Gruziya, Black Sea coastlands, Krasnodarsk region, even parts of Central Asia—two crops per annum should be possible, and more attention must be given to this matter.

' Plant feeders ' cultivating the crop of fodder potatoes. In 1954 the Omsky State Farm planted fodder potatoes over 100 ha. This area was planted by the so-called square-pocket method, which made it possible to implement machinery for cultivating the soil between the rows

The remainder of this report is devoted to livestock and to some more general criticism of shortcomings of the M.T.S. and of the State and collective farms.

More detailed work on maize hybrids is reported by I. Emel'yanov in *Sotsial. Sel. Khoz.*, 1955, **26** (3), 74, who discusses the possibilities of extending its cultivation, probably with new varieties, into all parts of the Soviet Union, including the arid zones, *e.g.* by improving its already extensive and deeply penetrating root system. In such areas it is noted that protein content tends to increase. Generally it is claimed that, in 1954, maize was grown in nearly all regions, including Archangel, Sverdlovsk, New Siberia, Altai etc. Details of yields in many of these are given, and some appear rather low, as is to be expected in view of soil and climate conditions. Most of the hybridisation work was done with the V.I.P. types. But during the past year or two the Moscow State Selection Station has introduced new varieties: Moscow 3, Moscow 5, Tulsa 9 etc. These, under conditions of the south Moscow and Tulsa regions, have given larger yields, from 35 to 70 centners/ha. in 1953–54.

Experience has shown that seed grown in northern latitudes has less germinating power. Even in southern latitudes, though the grain fully ripens, yet with increasing moisture content

in frosty weather germinating power is lowered or completely lost. It is therefore necessary, immediately after harvesting, to dry grain cobs intended for seed to a normal moisture content of 15–16%. Dry and well-ventilated storage is, of course, also important.

The Science Research Institute for Cereal Economy, for the non-black-earth belt, during the past year is said to have carried out important work in maize-seed selection and has evolved some varieties that are of great interest to the central parts of the Soviet Union. Yet, in view of the wide extension of maize cultivation in new areas, many important problems as to culture, seed selection and so forth remain to be studied. Maize cultivation, seed selection and improvement has also been the subject of numerous articles in recent issues of *Science & Life, Moscow.*

Cereal cultivation

An interesting account of cereal cultivation in the Altai district has been given by G. Vorkachev; included are accounts of some members of the now widespread Soviet organisation known as Heroes of Socialist Labour. Yields of 300 poods/ha. of hard spring wheat were reported from the Volchikhin region and 470 poods from the Slavgorodsk area. In some cases the yields are much lower, *e.g.* in the Egor'evsk locality down to 180 poods. It is pleasant to note that some of the M.T.S. in this part of Russia come in for honourable mention. One of the M.T.S. in this region, servicing several collective farms, had yields of hard spring wheat of 30–34 centners/ha. on a total area of 2,186 ha.

Perhaps it may be pointed out here that one of the undoubted weaknesses of Soviet organisation, especially in agriculture, is the overbalance of directors and managers. For example, the M.T.S. appear to have an overriding authority in respect to the collective farms that they service, with consequent friction with the managers and directors of those farms. There are also many other higher powers that have a say in everything. As reported above, the Deputy Minister of Agriculture had serious complaints to register against excessive officialdom and bureaucracy. Those achieving great results in the face of all this must indeed be heroes.

For 1955 sowings in Altai some 2,400,000 ha. of new land was brought under the plough the previous year and another 300,000 ha. in the spring of 1955. The total area sown is estimated at 7 million ha., of which cereals account for 5,700,000 ha. Despite all this, there are said to be still enormous reserves for further increased output and some suggestions to this end—fairly obvious ones—are put forward. One of these is the wider extension of the Mal'tsev system of soil cultivation referred to above. At the same time careful attention must be given to local conditions in determining depth of ploughing, *e.g.* thickness of humus layer, surface moisture etc., as in the brown and peaty soils, where ploughing depths should be carefully limited, say, to 20–22 cm.

Potential output

At the present time Vorkachev's institute is engaged on research on the best methods of utilising the potential fertility of new virgin or waste lands, with special reference to fertilisers, moisture accumulation and conservation, and steam treatment of soils. Other items in the programme must include the maize and sunflower crops. The possibilities are being investigated of growing sunflower in such relation with oats that the two crops are mutually beneficial. But the author's meaning here is not entirely clear.

Methods

Ploughing after maize or sunflower is not advisable, since the soil is sufficiently broken up, and after cultivating with the shallow disk plough the crop yields are quite as good as with ordinary deeper ploughing. The stalks or stubble should be left entirely or in strips for snow retention in winter. Moisture accumulation in the soil is of major importance. Therefore it is necessary in winter to store up as much snow as possible on the fields. Snow retention work should be supplemented by conserving the spring-melted snow, *e.g.* by harrowing in good time and other pre-sowing preparatory work. Moisture accumulation also involves generous 'feeding' of the crops and the use of local fertilising material to the utmost extent—by which is probably meant farmyard and pig and poultry manure—as well as bacterial and mineral fertilisers.

Other factors affecting crop yields are seed growing and selection and preparatory hot-air treatment. Although the hard wheat varieties are said to be among the best for Altaian conditions, these were still only grown to a relatively small extent in 1954 (2% of total wheat). In 1955 the percentage was to be raised to 10. The practice of pretreating the seed, *e.g.* with copper sulphate or with Granozan, 20–30 or more days before sowing, should be more widespread. In the case of Granozan, the dosage should be 1.5–2 kg./ton of seed. Yields of spring wheat may be thus increased to 33–34 centners/ha.

Since 1952 an organo-sulphur preparation known as TMTD has been used on some of the collective farms for pretreatment of seed. Its precise composition is not disclosed, but it is said to have given good results—better than Granozan. One advantage claimed is that it does not lower the efficiency of bacterial fertilisers. This is of special importance for spring wheat sown on newly cultivated virgin

Chemical spraying to destroy pests at the grape plantations of the Molotov State Farm in the Krasnodar Territory

An electric combine-harvester of the Korsun-Shevchenko Machine and Tractor Station

lands, where the seed must be treated with phosphorus bacteria. It is hopefully anticipated that the Altai cereal yields could be raised by about 600,000 tons. Hexachlorane powder is also recommended as a pesticide for young crops.

In regard to special mechanical sowing methods, much attention has been given of late in the Soviet Union to the so-called square and square-cluster methods (square pocket and narrow or close order type, Russian *uzkoryadni*), said to give superior results, though the method is rarely described in any detail (see below, however, on new Soviet agricultural machinery).

New machinery

In the December 1955 issue of *Science & Life, Moscow*, p. 33, N. A. Ivanov describes some of the newest machinery, with illustrations. Some of these were shown at the great Moscow Agricultural Exhibition (1955); others have been introduced since. Despite the great progress made, reference is directed to Bulganin's strictures at the last (July) Plenary Session, namely, that the technical level in agriculture is still below that required. Several improved types of tractor are first presented, mostly diesel type, some with caterpillar tread, to meet the widely diverse conditions of soil and climate throughout the Soviet Union and having maximum economy in respect to fuel and efficiency. Soils include those of the northern territories, peat formations and swamps more or less reclaimed, arid districts of Central Asia and so on. Tractor S-80-B2, for swampy land, has extra-wide caterpillar tracks, up to 1,000 mm., with pressure on soil of only 0.28 kg./sq. cm. Another, KDP-35-2, has been specially designed for irrigated crops, *e.g.* cotton lands and for intercalary cultivation of tall crops, such as maize and sunflower. Other special types are also noted, including machinery adapted for Mal'tsev's new system of soil cultivation.

A special five-point plough for this new system is the P-5-35-TsU model made by the October factory in Odessa; it is of the universal, non-terracing type. It ploughs to a depth of 60 cm., thus including subsoil cultivation without inverting layer arrangement. With tractor S-80 (most commonly used in Soviet farming) it can plough 0.63 ha. per hour.

Several new seed drills have been introduced, of which three may be briefly noted here. The first is the SUB-48 for close order sowing, *i.e.* with rows only 70–80 mm. apart instead of the usual 150 mm., whereby yields are said to be increased by 15–20% or more. It operates on the so-called Bogachev system and has 24 disk coulters or hoes, each divided for two independent furrows or seed drills.

For the new square-cluster or nest-type planting of potatoes, maize, sunflower and other crops the SKGK-6 machine has been introduced. It is said to cover up to 20 ha. per day. Another machine, somewhat longer established than the other two, is the KRN-4,2, used both for intercalary cultivation and for sowing of fertiliser to growing crops; it deals with about six rows at a time at the rate of 2.2 ha. per hour. Other machines of more or less recent introduction described by Ivanov include harvesters, stock-feed machinery, mills etc.

Photos: S.C.R., London

Coconut Plantations

Productive capacity of coconut plantations in Travancore-Cochin (India) is to be increased during the second Five-Year Plan period by controlling pests and disease. Aerial spraying of coconut plantations is to be carried out in Cochin and Trivandrum during the next cold season. Each plane will be able to spray about 90 acres of coconut plantations in seven minutes. It is estimated that 7.5 million trees in Travancore-Cochin are affected by pests and disease.

Technical News

The August issue of *Dairy Engineering* will include articles on 'Continuously Working Pasteurising Apparatus' and 'Handling and Processing of Milk—A Summary of the Problems'.

Food Manufacture for August contains articles on 'Pressure-Packed Foods' by A. Herzka, B.SC., 'Fermented Drinks and Nutrition' by E. C. Barton-Wright, D.SC., F.R.I.C., and 'Better Grapefruit Products' by Howard Fox.

The contents of *Fibres* (*Engineering and Chemistry*) for August includes articles on 'Some Soilless Cultured Natural Fibres' by J. W. E. H. Sholto Douglas, B.SC., DIP.AGRIC., and 'New Techniques and Products for French Textile Industries'.

Articles included in the August issue of *Corrosion Technology* are 'The Flame Spraying of Metals and Plastics' by G. R. Lawrence, and 'A Superficial Glance at the Field of Corrosion' by A. deS. Brasunas.

Report on the French Agricultural Industry

M. LENGELLÉ

M. Lengellé presents one of his regular contributions on the state of agriculture in France. He draws attention to the great setback received during the freeze-up earlier this year. France, with many other European countries, suffered badly at this time.

AN examination of the first provisional figures for 1955 shows that there is still a strong tendency towards increased animal production and a decrease in crop production. This evolution continues despite contrary factors which loomed large at the end of 1955.

French crop production for 1955 was already characterised by a group of significant factors. These are:

1. A continuation of the movement for reclassing soils. Certain crops (rye, buckwheat), are becoming more and more relegated to poorer soils.

2. French agricultural effort is tending to be concentrated on the more productive crops. The year 1955 saw an increase in the acreages devoted to wheat, barley, maize and rice at the expense of rye, oats and buckwheat, as shown in Table 1.

In the same way, with oleaginous plants, the progressive abandonment of crops other than rape is to be noted (see Table 2).

In a general way it is possible to observe a slow reduction in the production of beet and potatoes with profit to other crops, such as cereals and the oleaginous crops.

TABLE 1

Area cultivated, thousands of ha.			
	Average 1950–54	1954	*At 1 Nov.,* 1955
Wheat, barley and maize ..	5,775	6,133	6,315
Rye, oats and buckwheat ..	2,801	2,643	2,542
Production, thousands of metric tons			
Wheat, barley and maize ..	11,170	14,047	14,133
Rye, oats and buckwheat ..	4,116	4,153	4,074

TABLE 2

Area cultivated, thousands of ha.			
	Average 1950–54	1954	1955
Rape ..	94	56	65
Others ..	42	31	28
Total ..	136	87	93
Production, thousands of metric tons			
Rape ..	129	79	100
Others ..	36	29	29
Total ..	165	108	129

3. Climatic conditions having been unfavourable, the increase in yields which should have resulted from the cultivation of the more profitable crops was not obtained. However, there was a slight increase in the yields of fibrous and oleaginous crops.

But if the quantities were lower than anticipated, the quality was, in general, excellent. The sugar content of industrial beets attained and sometimes exceeded 18%. Wheat headed better than in a normal year and the exceptional quality of wines for the year 1955 is recognised.

Although the general harvest results remained stationary, it could be noted with interest that the production of rice (paddy) and maize was 80 thousand and one million metric tons respectively. Rice production for 1955, therefore, was equal to the record year 1952. Maize production for 1955 was double the prewar figure and was sufficient to meet the requirements (estimated at 1.2 million metric tons) of Metropolitan France.

The climatic factors which brought about the reduction in crop yields were also responsible for a decrease of one-twelfth in the production of milk for 1955. On the other hand, the breeders had their resources of hay cut down because they had to hand-feed during the bitter winter. These difficulties form part of a group of unfavourable social and economic factors.

Livestock

If we compare the number of beasts as at 1 October, 1954, and 1 October, 1955, we find results as shown in Table 3.

TABLE 3
ANNUAL PRODUCTION FOR 1954 AND 1955
(Thousands)

	1 Oct., 1954	*1 Oct.,* 1955	*Increase,* %
Cattle..	17,273	17,560	2
Sheep..	7,985	8,191	2
Pigs ..	7,560	7,772	2
Goats..	1,269	1,249	—

Despite this insignificant increase, the production of meat shows that there was a supplementary effort on the part of the breeders (see Table 4).

TABLE 4
WEIGHT OF ANIMALS SLAUGHTERED UNDER VETERINARY INSPECTION
(Thousands of metric tons)

	Jan.-Sept., 1954	*Jan.-Sept.,* 1955
Cattle (adult)	548	557
Veal ..	206	214
Sheep ..	60	62
Pigs ..	378	396
Horses ..	63	64

The increase, however, did not hold for the last three months of 1955.

Agricultural credit

If the commercial figures for the first nine months of the years 1954 and 1955 are studied, it is found that agricultural exports have developed so much that the value of exports has now exceeded that of imports (see Table 5).

TABLE 5
VALUE OF AGRICULTURAL EXPORTS AND IMPORTS
(Milliards of francs)

	Jan.-Sept., 1954	*Jan.-Sept.,* 1955
Exports ..	93.2	133.3
Imports ..	109.6	119.9

The year 1955 saw the beginning of a financial scheme of which the object is to orientate production of products for which France is competitive on the world market. The existence of this

scheme gives some useful aid to the French agricultural population.

Freeze-up

The wave of cold which overtook Europe in February 1956 caused considerable damage in France. On average the country sustained 25 days of below-freezing conditions. This led to a great reduction in fodder reserves, as a tremendous amount had to be fed out, and there was, too, an almost complete annihilation of an important part of the fruit and vegetable crops. The deficit in vegetables was estimated to amount to two months' production. Both the stone-fruit trees and almond groves suffered badly. Finally, about half of the area sown with oleaginous crops was so badly hit that the entire crop in this area perished.

But it was the cereal crops that suffered most. More than 2 million ha. (4,942,000 acres) of wheat was totally destroyed. The harvest, taking into account the extensive spring sowing, may only amount to 5 million metric tons (10.5 million metric tons in 1954–55).

The difficulty of maintaining locally the livestock and the necessity for intensifying vegetable production proclaims, perhaps, a general tendency for 1956. It would be the inverse of the tendency seen in 1955. However, we must wait for the revised estimates of production in order to gain an exact idea of the situation.

Precision Surface Drainage for Sugar-cane Land

(*Continued from page* 310)

moisture level is too high. If it is dry enough to be ploughed, it is generally dry enough to be formed and graded. Yields may be reduced if this work is done when the land is wet or muddy. On a test plot worked when the soil was too wet the yield was reduced by half the first year and only salvage cane was harvested the second year. The soil had been severely compacted. Since packing will also take place even when the soil is dry, machines having low ground pressures should be used for grading and levelling whenever possible.

Costs

The grading and levelling of typical sugar-cane land requires from 4½ to 5½ hours per acre. Areas that have been subject to flood-water influence may require as much as 10 hours per acre. In general, the cost of this work will vary from $45 to $100 per acre.

In many cases this cost is liquidated by increased yields the first year. On test plots, for example, an increase of 5.81 standard tons per acre was noted on graded and smoothed land over the yield from an ungraded check plot. The monetary value of this increase was approximately $45 and was obtained by an estimated expenditure of $45. In addition, the cost of growing the sugar-cane was reduced somewhat because the machinery operated more easily and efficiently on the graded and smoothed lands.

Land grading should find wide application in the humid areas, for it eliminates the alternative of additional quarter-drains and lateral ditches that would take more land out of cultivation and result in smaller cuts that would be inconvenient to farm. Currently the practice is being adopted by cotton farmers of the Delta regions, where drainage is sometimes as much of a problem as it is in the sugar-cane regions of Louisiana. As more farmers become familiar with the machinery and methods for grading and levelling many improvements in the application of the practice will evolve. This should make land grading and smoothing more practical and open the way to a more profitable and wider use of the practice.

Radioactive Treatment for Barley

Barley is being given radioactive treatment in South Australia in an effort to improve its quality.

The tests are being made at the Waite Agricultural Research Institute, where an *X*-ray machine will be used to observe changes in the growing plants.

It is hoped the treatment will result in strong plants which are more disease-resistant and better able to stand up to wind and rain.

Soil Conservation

The conference of State Ministers of Soil Conservation (India), which ended in New Delhi on 27 April, has recommended that a sufficient number of personnel should be trained in soil conservation methods. Training in the subject should be given in agricultural schools and colleges.

The conference set up a committee to co-ordinate survey research and training in soil conservation.

Rs. 270 million will be spent on conservation under the 2nd Five-Year Plan.

New Methods for Testing Viability of Seeds

(*Continued from page* 311)

may be of particular value for difficult problems of seed-testing. However, in the initial phase of research it is not possible to define the limitations of the technique.

Resazurin is blue in slightly alkaline solution, but in an acid solution it is red. The resazurin is readily reduced first to a red colour, then to orange and finally to white.

A few years ago Plaut and Halfon[3] employed a solution of 0.003% resazurin for testing the seed of pea, bean and cucumber. Germs of viable seed remain white, but non-viable seed is turned red or blue. In the above concentration the resazurin does not destroy the germination capacity of the seed. Thus all the seeds whose germs become white germinate, whereas seed with no or blue germ does not.

These promising results prompted us to try this method on cereals. After removing the pericarp the grains were immersed for six hours in a 0.01% resazurin solution. In seeds thus treated it is easy to observe the staining of the coleoptile and the radicule. If the coleoptile or a major part of the germ is stained blue the seed is dead; if, on the other hand, it appears to be red or pink the seed is assumed to be alive. Further investigations to determine the suitability of this method for testing citrus and peanut seeds are in progress and will be published shortly.

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South African Agricultural Developments

(From our Cape Town Correspondent)

THE wide lands of kaffircorn in the Western Transvaal and the smaller fields everywhere in the northern and eastern parts of the Union have suffered less from this year's summer drought and heat wave than the maize crops and have moved steadily to the fruiting stage. The maize crop will not now exceed the 30 million bags once predicted as the minimum crop. Mr. E. Kahn, a Johannesburg grain expert, is sure that it will not be less. Mr. Kahn's estimates, made weeks before the official estimates of the Department of Agriculture, have never been out by more than 2 million bags in 10 years and have often been within 1% of the eventual total. The losses have been in the areas where there are large numbers of small planters, but 15% of the growers produce 85% of the Union's crop—and these big men have the best lands, machine cultivation and great knowledge and experience. The kaffircorn crop will be less this year because of smaller plantings. When the crop is small the price is higher and the Bantu who buys the corn in the form of malt gets less for his money. He buys for a fixed amount and will not pay more to get more malt. If kaffircorn prices are high, he sells kaffircorn to buy maize; if they are low, he buys kaffircorn instead of maize.

Profit

The Maize Control Board made a profit of £393,409 on the exports of 7,682,000 bags of maize and maize products for the year ended 30 April, 1955, according to the recently released annual report. The board says the profit can be viewed in a proper perspective only when considered in relation to an amount of £794,225 debited against the stabilisation fund for the costs of storing the huge carry-over stocks of maize which could not be exported in that year. The costs of railage, storage and handling amounted to 7s. 2d. a bag, compared with 5s. 8d. the previous year.

Tobacco

The Union's tobacco yield in 1954–55 was one of the smallest for many years and the production of each class of tobacco proved to be much less than the normal annual demand in the country, says the annual report of the Tobacco Industry Control Board.

Tables published in the report show that production dropped from 53,387,021 lb. in 1951–52 to 34,314,847 lb. last year. The board said that tobacco farmers' pessimism about the future was understandable in view of the many setbacks caused by drought, hail and floods, the need for new culture methods, rising production costs and labour problems. In fact, the tobacco industry in the Union is at the crossroads.

Faced with a seeming continuous set of old and new problems, some growers may be tempted to abandon tobacco in favour of some other crops. On the other hand, the increasing demand for tobacco in the Union seems to hold out lucrative rewards to those who persist. The consumption of tobacco in the Union had increased by about 1 million lb. a year in the last 34 years, which meant that in 30 years the Union would need 90 million lb. a year. At the same time, there had been a yearly decrease in the Union's tobacco yields, and that of 1954–55 was the smallest since 1945–46.

To bridge the gap between production and consumption the Tobacco Industry Control Board had been obliged to recommend a duty-free importation of at least 10 million lb. of flue-cured tobacco from Rhodesia. This quantity, it was expected, would be imported in the next year or two. Among the factors responsible for the decline is that Orinoco tobacco, to which South African farmers changed after 1952, yielded smaller returns than the Amarello tobacco.

Fruit

Ideal growing conditions in the Western Cape have produced a fruit crop of high standard, free from disease, which should be bigger than last year's crop. Rain—which might have ruined the export grapes—was absent and the absence of violent south-easters has reduced windfalls.

A fairly cool summer has meant that the season has been drawn out and there has not been the serious congestion that might have occurred because the season started so late. Canning factories are working overtime to deal with the peaches and pears that are coming in and cold-storage space is in keen demand.

Citrus

The South African citrus crop to be exported this year is estimated at 7 million cases, compared with 6½ million cases in 1955. The South African orange will, however, have keener competition this year on the overseas market from Mediterranean and Brazilian crops, according to officials of the Citrus Board. On the other hand, there will be less competition from California and Spain, where the crops are less than in previous years. In 1954 the citrus cheque was more than £13 million. This year it will be about £15 million. Britain is the Union's best overseas customer. In 1954 the British people ate more than £8 million of South African citrus. Exports to Britain should increase year by year.

Deciduous fruit

In regard to deciduous fruit, although the opening prices realised on overseas markets were lower than usual this season, quotations afterwards firmed, rising to at least the levels of last year. Pears, particularly, have been in good demand and shipments of peaches and apricots to the U.S.A. have been satisfactory. That market is still hampered by the lack of refrigerated space in ships on the American run.

Sugar-cane

The Tomlinson Commission on Bantu development in South Africa recommends that sugar-cane farming in the reserves be encouraged. It says there are 126,000 acres suitable for sugar-cane production, of which 100,000 acres ought eventually to be developed. On this area 12,500 families could be settled. Plots should

be allotted by control committees, individual plots to be of a size capable of producing about 90 tons of sugar-cane a year. The development of a fibre industry based on sisal and New Zealand hemp is proposed. Crops should be planted on land not suitable for food crops. About 25,000 morgen of sisal and up to 10,000 morgen of hemp should be aimed at.

Dried fruits

The principal dried-fruit packers of South Africa have now transferred total assets valued at about £2 million to the South African Dried Fruit Co. Ltd., which is run as a co-operative. A statement by the co-operative says that the necessity for a merger arises from the fact that a crisis has developed in the dried-fruit industry in South Africa.

In 1938 the Australian dried-fruit industry was confronted with a similar crisis and to rationalise the industry the individual packers amalgamated, with the result that the Australian dried-fruit industry is the most efficient and best organised in the world. It has been established that the Australian dried-fruit industry has effected substantial savings in cost structure as compared with the South African dried-fruit industry with its production of about 16,000 tons of dried fruit per annum. In Australia one dried-fruit pack-house alone handles 75% more tonnage than the entire South African annual production. It will thus be evident that one dried-fruit packer in South Africa can conveniently handle the entire production of dried fruits. This merger has been brought about with a view to effecting economies which will reduce packing costs and enable the South African dried-fruit industry to put its house in order and be in a position to compete on world markets.

The rationalisation that will now be introduced in the dried-fruit industry will benefit producer and consumer. The benefits arising from the merger will result in increased production.

New Type Forestry Exhibition

THE first International Forestry Exhibition took place recently in Stockholm. Many countries (12) were represented and there were many overseas visitors. The exhibition was arranged on entirely new principles and it was possible to follow the different phases in forest management: from planting, periods of selected cutting, final cutting to the planting of a new generation of trees. Other exhibits showed how timber is transported to the saw mills, worked and finally distributed as wood, paper, pulp etc.

The exhibition also included instructive demonstrations showing modern barking machines, effective motor saws, tractors and other new inventions for the mechanisation of forestry working. Altogether about 1,500 types of machines, tools and implements were shown.

The great importance of forestry for Swedish economic life is perhaps best illustrated by the fact that about 40% of the forest products are used within the country and yet the remainder is sufficient to make up almost half of the total Swedish export.

Swedish forests contain no less than 2 milliard cu. m. of timber. This great capital grows by 60 million cu. m. per year. Of this growth, 50 million cu. m. are cut annually, which means that Sweden sets aside a saving account of 10 million cu. m. every year. An interesting illustration stems from the fact that those 50 million cu. m. of timber represent no less than 1¼ milliard trees, which would fill nearly 3 million railway trucks. Such a train would almost encircle the globe.

The Forestry Week, an annual event with old traditions, assembles forestry people from all over the country. At the 1956 Forestry Week, the thirty-eighth, which took place at the same time as the Forestry Exhibition, the problems of transportation and the importance of better roads were the main points for discussion. These questions were also taken up in connection with the International Forestry Exhibition.

Although motor trucks are used more and more for transport in the forests, floating is still very important, especially in the northern districts. The rivers still are, and will remain for a long time, the cheapest and best means of transportation. There is, however, stiff competition with the power plants adjacent to the rivers. In the discussions it was mentioned that perhaps in the future atom-power plants might solve the problem by making the rivers free for the use of logging. In recent years aircraft have been used in forestry for many purposes, but transportation by helicopters is a question for the future, for at present helicopters can only carry 300 kg.; this would not be a paying proposition.

The horse also is still required in forestry work. It is true that the horse cannot compete with trucks and tractors on long distances, but for short transport it is still very useful. During the Forestry Week a problem in this connection was also discussed, for the number of horses has dropped very rapidly and efforts must be made to stop this development.

In conjunction with the Forestry Week, the International Exhibition was a valuable contribution, a reminder that forestry as well as agriculture must no longer be regarded from exclusive national points of view, but in the light of international co-operation that will promote a more rapid development in these fields.

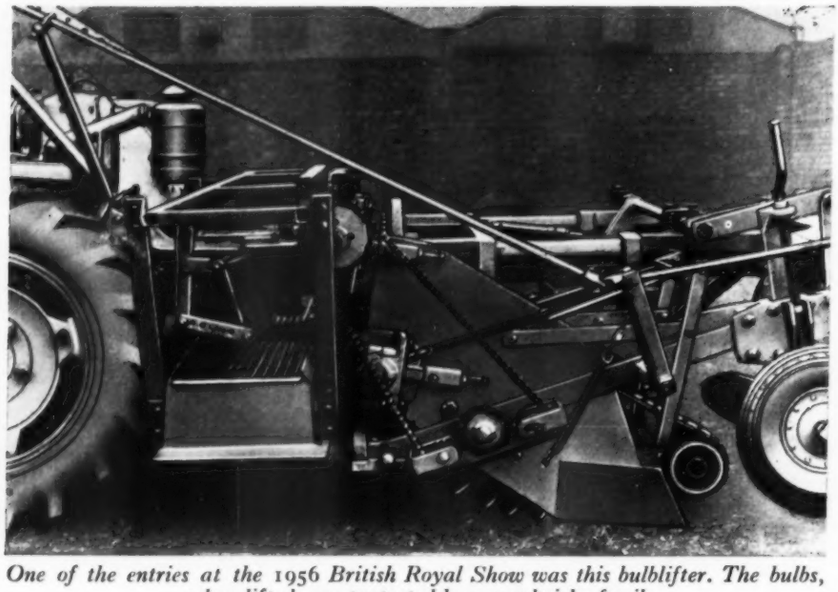
RICHARD HAKANSSON

Portugal/U.S.A. Deal

The U.S. Department of Agriculture has given details of an agreement between the U.S.A. and Portugal under which Portugal will buy 7,100,000 dollars worth of U.S. farm commodities. The amount includes certain transportation costs which the Department has not revealed.

Portugal would pay for the commodities in escudos and American exports would be reimbursed in dollars by the Agriculture Department.

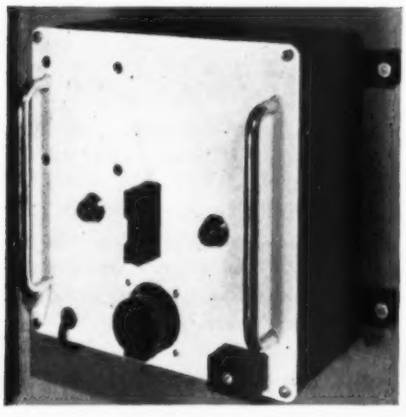
The Department said it had issued a purchase authorisation to Portugal on 11 May with the understanding that the formal agreement would be signed by the two countries ' prior to 31 May, 1956 '. The authorisation was for 735,000 bushels of wheat worth 1,420,000 dollars, which would be bought by a Portuguese firm. Additional authorisations would be announced later.



One of the entries at the 1956 British Royal Show was this bulblifter. The bulbs, when lifted, are protected by a sandwich of soil

Machinery Trends Seen at the 1956 Royal Show

THE 1956 Royal Show was held at Newcastle upon Tyne from 3-6 July for the first time in 21 years. Nearly 1,650 overseas visitors attended the Show on the spacious Town Moor, which was an ideal site for this annual itinerant exhibition. Many (34) new implements were entered for the Silver Medal, but only 17 of these were accepted for judgment (subject to test reports being available).



Gascoignes electronic control box for the milking parlour

Among these were:

Agricultural Supplies (Cambridge) Ltd., Cintra House, Cambridge, England who were competing with their ' Simplex ' grain-drying system. It is a practicable and economical system of grain drying which can be easily installed by the average farm worker. The silos can be used as additional storage during the winter months, providing one silo remains empty to allow for grain being ' aired ' from one silo to the other. The main principles of the system can be summarised thus: air of 60% r.h. or less is introduced into the bin through a vertical internal cylinder of expanded metal; from this cylinder the air flows radially through the grain, finally escaping to the atmosphere through the apertures in the expanded metal panels which form the bin.

This method enables the drying air to be directed through the grain by shorter paths than is the case in floor-ventilated bins and thus results in a lower resistance being offered to the airflow, so that at least four times as much air will be provided for a given fan power.

Conversely, in a radially ventilated bin the same volume of air can be provided for about one-quarter of the horsepower needed to drive air through a floor-ventilated bin of similar dimensions.

Harvest Saver's bale stooker

Allis-Chalmers Great Britain Ltd., Essendine, Stamford, Lincs, England, exhibited a two-clutch power control with auxiliary rear axle clutch. They claim that safer tractor operation is assured, because with the depression of a pedal all motion is stopped and by pulling a lever the tractor is stopped to allow p.t.-o., belt pulley and hydraulic system to continue in operation.

The ' Mistree ' water-saving valve was entered by *E. Allman & Co. Ltd.*, Birdham Road, Chichester, England. It was designed to overcome the serious waste of water due to leakage from faulty ball valves.

Atkinson's petrol-powered silage cutter. It can also be used for peat and manure

Atkinson's Agricultural Appliances Ltd., Enterprise Works, Kendal Street, Clitheroe, Lancs, England, exhibited a silage cutter known as the ' Silo-Aid '. This implement was deferred for judgment from the 1955 Show. It is a power-operated tool for cutting silage, peat and farmyard manures. It incorporates an oscillating blade which is driven by an 80-c.c. petrol engine or ⅓-h.p. a.c. electric motor.

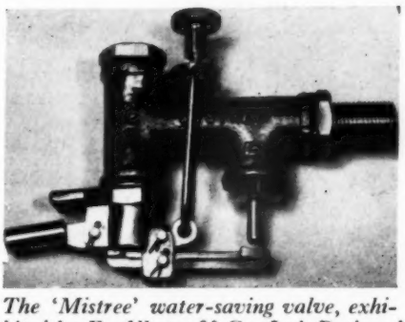
A tractor winch was introduced by *T. T. Boughton & Sons Ltd.*, Amersham Common, Bucks, England. This was described and illustrated in WORLD CROPS, 1956, **8**, 208.

The 'Rowhoe' is a rotary hoe which is suitable either for mid-mounting or rear-mounting and is designed to hoe all root crops. It is manufactured by the *Catchpole Engineering Co. Ltd.*, 19 Hatter Street, Bury St. Edmunds, Suffolk, England, and is adjustable to row-crop spacing from 12 in. upwards to a maximum total width of rows of 10 ft. The design of the blade ensures total destruction of the weeds of all sizes, leaving a very fine tilth.

For the dairyman *R. J. Fullwood & Bland Ltd.*, Fullwood Works, Ellesmere, Salop, England, entered the 'Fullwood' pulsomatic milking system, which is a controlled system of electrical pulsation built into the pipeline; it completely eliminates individual pulsators from the buckets. A master control box supplies an intermittent current to a low-tension wire on the pipeline and each stall tap is a fully automatic pulsating tap which only comes into operation when the stall tube is attached. The pulsomatic system can be used with any type of milking machine unit with little or no modifications.

Gascoignes (Reading) Ltd., Berkeley Avenue, Reading, England, showed a 'Bulkolder' Mark IV farm milk tank and electronic control box for the dairyman.

Catchpole's 'Rowhoe' in the mid-mounted position



The 'Mistree' water-saving valve, exhibited by E. Allman & Co. Ltd. Designed to overcome waste water caused by faulty ball valves etc.

The Simplex grain drying system (Agricultural Supplies)

The 'Nu Way' manure spreader was entered by *Gray's of Fetterangus*, Aberdeenshire, Scotland; the main advantage of the 'Nu Way' is that farmers can make use of their own existing tipping farm trailers. It hooks on behind the tipping trailers (preferably those types where wheels are placed well to the rear). The hooking up of the 'Nu Way' is automatic. The three-legged jacks are so placed that when in use they are dropped to the rear of the 'Nu Way' spreader. The trailer, when reversed towards the spreader, contacts its pick-up hooks and once these have contacted and the spreader still reversed it results in the two three-legged jacks jacking up the machine until two spring-loaded catches, one at each end, spring into position. The trailer is now drawn slightly forward and the three-legged jacks hooked up. Once the spreader is hooked to the loaded trailer (the trailer tail door having been previously removed) the trailer is tipped to an angle of 45°, when the manure will start slipping rearwards, and it will continue to do so until the trailer is emptied. The 'Nu Way' spreader is driven by its own petrol engine. All main drives are by V-belts, thus breakages are reduced to a minimum; should obstruction, such as stones, fencing wire, posts or the like, enter the machine the V-belts will either slip

or the engine (which is not overpowered) will stall.

An implement which will probably be of great benefit to many farmers is *The Harvest Saver & Implement Co. Ltd.*, The Works, Kirbymoorside, York, England, bale stooker. It bales and pyramids five bales, so stacked that the lower bales rest on their edges and not on their faces. As a result, not only is maximum ventilation positively guaranteed, but the shape of the pyramid—following the principle of thatching—causes the rain to flow down the side of the bales instead of collecting on their exposed flat surfaces.

A haulm stripper and potato digger were entered by *Wallace Henderson Products Ltd.*, 3 Coshno Hardgate, Dumbarton, England.

H. Leverton & Co. Ltd., Spalding, Lincolnshire, England, were showing a bulb-lifting unit. A saving of 60–70% in man-hours over existing bulb-lifting methods is claimed for this implement. The bulbs are lifted on to a plated conveyor, protected by a sandwich of soil

Fertiliser distributor shown by Onneley Implements

and are finally deposited at a distance of a few inches on to the soil.

The Cooper ' Limemaster ' was exhibited by *Onneley Implements Ltd.*, Newcastle Road, Woore, near Crewe, England. This is a tractor-drawn fertiliser distributor which consists of twin hoppers running on rails mounted on a steel chassis. The principles involved are: (*a*) Sowing the fertilisers by gravity feed direct from the hoppers on to the ground, ensuring an absolutely even spread and almost completely eliminating wind drift; (*b*) placing the main weight of the machine on to the tractor wheels, thereby assisting traction; (*c*) conveying the fertilisers in twin hoppers which can be opened to a 14-ft. spreading width, yet can be closed for transport purposes to only 8 ft.

The power-driven trailer that was to have been shown by *The Salop Trailer Co. Ltd.*, Midland Carriage Works, Old Coleham, Shrewsbury, England, has been held over for judging until 1957. This firm, however, did show, although not entered for the Silver Medal, a selection of other trailers, power-driven manure spreaders, wheelbarrows etc.

Scottish Mechanical Light Industries Ltd., Main Street, Prestwick, Ayrshire, England, exhibited the Scotmec-Oxley instantaneous moisture meter. It measures the moisture content of grain in bulk and in sealed sacks without the necessity of sampling. It is comprised of a probe unit and a special ohmmeter with built-in 500-V. generator. Nine spear-like probes are thrust through the texture of the sack, the instrument handle is turned and the moisture content of the grain is instantaneously registered on the instrument dial.

A tractor strake was entered by *J. E. Shay Ltd.*, Basingstoke, Hampshire, England. This implement was held over from last year. The ' Rotostrake ' is a new-type tyre girdle, which increases its grip on the tyre as ground conditions become worse. Initially designed to deal with winter conditions of deep, heavy mud, which produce unavoidable wheel spin and delay to many of the heavy jobs around the farm, the ' Rotostrake ' has also been found valuable in cases where virgin or derelict ground resists early attempts at reclamation.

For the dairyman *Swifts of Scarborough Ltd.*, Olympia Works, Durham Street, Scarborough, England, introduced their all-metal egg case and universal loading and emptying device.

Fullwood's pulsator tap is started by insertion of the stall line

J. E. Shay's tractor strake

The cases are specially designed to give rigidity and to withstand the hard wear to which they are subject. They have special interlocking corner brackets to prevent movement when stacked and are galvanised after manufacture to give them a protective coating of zinc and so add to their lives. Each case is made so that it may be used on the ' Universal ' loading and emptying device, which is very simple to operate and shows a positive saving in time and labour costs. One such device is sufficient for any number of egg cases.

Other exhibits

Among the many other exhibitors were:

Alley Trailers Ltd., of Heybridge Works, Malden, Essex, England, who showed their 4-ton manure spreader, which has an all-steel chassis and body, making it ideal for the contractor and the large farmer. It has the new ratchet-type drive and the beaters thoroughly pulverise all chunks, cutting and shredding long and stringy straw embedded in the manure.

A representative selection of fuel-injection equipment for diesel engines and electrical equipment for agricultural tractors and for stationary and portable engines was exhibited by *C.A.V. Ltd.*, Acton, London, W.3, England. The fuel-injection equipment includes: Single- and multi-cylinder injection pumps with pneumatic and mechanical governors, as fitted to many of the most popular makes of tractor and agricultural engines, sectioned to show the construction and method of operation.

Cooper, Pegler & Co. Ltd., P.O. Box 9-307, Burgess Hill, Sussex,

England, showed a full range of spraying and dusting machinery. They were able to offer immediate delivery of most of their machines.

For the first time *Dorman Sprayer Co. Ltd.*, Ditton Walk, Cambridge, England, were able to show equipment other than crop-spraying machinery, and the new equipment included a mid-mounted ditch cleaner and two different models of hedge trimmers. Tests have shown that the ditch cleaner is capable of cleaning up to two miles per normal working day, cleaning to a depth of 3 ft. 6 in. The shovel is automatically emptied at the top of the lift and the operator has full control over both tractor and cleaner.

Firestone Tyre & Rubber Co. Ltd., Brentford, Middx, England, displayed examples from the wide range of Firestone agricultural tyres. There were two types of agricultural tractor rear wheels—the curved bar open-centre ground grip and the industrial, the latter specially designed for tractors operating mainly on the roads or used on static power jobs.

A range of agricultural equipment was shown by *Fisher Humphries & Co. Ltd.*, Pottery Lane, Newcastle upon Tyne, 1, England. It included the GBW-Fisher sugar-beet harvesters, two fully-mounted and one semi-mounted. The Model 70 semi-mounted has a side topping unit as standard and a top-saving unit is available as an extra. The machine can be fitted to all tractors with three-point linkage.

Other equipment shown by this firm included a three-furrow disk plough, hedge cutter, three-row ridger and subsoiler and mole drainer.

The display of the *General Electric Co. Ltd.*, Magnet House, Kingsway, W.C.2, England, included for the first time at the Royal Show the fluorescent fitting specially developed for use in seed potato chitting houses. The crop-drying section of the stand included a model of a multi-purpose crop drier, together with a display showing alternative construction of drying areas. Platform and silo grain driers of varying capacities were displayed.

The Hart Agricultural Engineering Co. Ltd., Grosvenor Street West, Birmingham 16, England, were showing the Micro-Hart motorised knapsack sprayer and duster, which combines spraying and dusting in one machine. The machine is designed for dealing with a specific problem and can be used for the application of all forms of liquid, suspension or powder chemicals for the control of insects and diseases. The machine has a remarkable range, which is achieved by the venturi design of the nozzle, producing a high booster action and giving a fine no-drip spray. Particle size is variable over an exceptionally wide range without the need for special attachments or nozzles. A deflector is provided for upward spraying at low levels, ensuring maximum coverage underneath the foliage. Maximum range in still air, using water, is 24 ft. horizontal, 17 ft. vertical. Powerful penetration is achieved of all types of foliage and at the same time the air stream oscillates the leaves, ensuring good coverage on tops and undersides as well, thus obtaining maximum efficiency from the air passing through the machine. Power-tank capacity, according to density, is 16 lb.

The Scotmec-Oxley instantaenous moisture meter. The necessity for sampling has been overcome with this apparatus

Swift's all-metal egg case

Exhibited for the first time by *Hayters Ltd.*, Spellbrook, Bishop's Stortford, Herts, England, was the ' Highway ' rotary grass cutter. It is a three-point linkage, p.t.-o. model, grass cutter with a 6-ft. 6-in. cut; it is mounted on skids and is primarily designed for use on roadside verge work. The cutting units of this machine are completely enclosed to ensure safety when working in public places. Other equipment included their orchard model rotary grass cutter and motor scythes.

Mitchell, Colman & Co. Ltd., Hollybank Street, Radcliffe, Manchester, England, exhibited the ' Koela ' FH54 forage harvester. It is built on conventional lines and is an American-type harvester. It uses a 4-ft.-wide pick-up and the standard complement includes an outlet to the trailer about 9 ft. from ground level. The power requirement of the machine is noteworthy, as it is extremely low at 22 h.p. to 25 h.p. The pick-up is adjustable from the tractor driver's seat and so is the outlet of the blower. The trailer can be towed by the outfit or delivery may be to the side. It can be used for harvest-

ing grass, lucerne, kale, maize, sugar-beet tops etc. Other equipment shown included cutter-blowers and chaff cutters, screw conveyors, sugar-beet harvesters, grain conveyors etc.

A new manure spreader was shown by *Jack Olding & Co. Ltd.* It is known as the ' Hatfield '. It is conventional in design and ruggedly constructed. A lime-spreading attachment will be available as an optional extra. Other equipment shown on this stand included the Vickers VR180 tractor, John Deere automatic wire-tying pick-up baler and Nordberg Buday portable power saw.

F. Perkins Ltd., Peterborough, England, exhibited an International T6 crawler tractor fitted with an L4 conversion engine. Other conversion units on view included P3 and L4 (TA) diesel engines in Fordson, Allis Chalmers and Ferguson tractors.

A ' Horn-draulic ' loader designed for the new ' Farmall ' Super B.W.D. tractor was shown by *Steel Fabricators (Cardiff) Ltd.*, Pengam Road, Roath, Cardiff, England. Other equipment displayed included the ' Shawnee ' Scout Model 70 digger and ' Shawnee ' special loader mounted on a Ferguson tractor. The digger is capable of digging under normal conditions to a depth of 12 ft., the bucket widths varying from 10 in. to 24 in. The loader has a lifting capacity of 2,000 lb. to a height of 9 ft.

A last-minute entry was exhibited by *Stanhay (Ashford) Ltd.*, Elwick Works, Ashford, Kent, England, in the form of the Stanhay ' Quicklifter '. It can be attached to the tractor three-point linkage in a matter of seconds and is secured by three pins only. It is suitable for lifting or unloading sacks, barrels, cases etc. and operates from ground level to 4 ft. 8 in.

Taskers of Andover (1932) Ltd., Waterloo Iron Works, Andover, Hants, England, exhibited an extensive range of trailers, including a 3-ton hydraulic tipping farm trailer and a 25-cwt. hydraulic low loader suitable for smallholders and market gardeners. Other implements included the Peterson buckrake for silage conservation and other purposes, the Peterson grader baler for contouring, levelling, road-making etc., pig-feed mincers etc.

Of special interest was the Wolf farm maintenance kit, manufactured by the *Wolf Electric Tools Ltd.*, Pioneer Works, Hanger Lane, London, W.5, England, consisting of one ¼-in. production drill, one ½-in. general-duty drill and stand, one 7-in. horizontal sander, one 6-in. bench grinder and a 7-in. portable saw. The kit is packed in a wooden service case. This firm also showed a complete range of industrial and home craftsman portable electric tools of interest to farmers and agricultural engineers.

The 'Swipe', a new general-purpose slashing machine manufactured by *Wolseley Engineering Ltd.*, Wolseley Works, Electric Avenue, Witton, Birmingham 6, England, was to have been entered for the Silver Medal award, but has been held over until 1957.

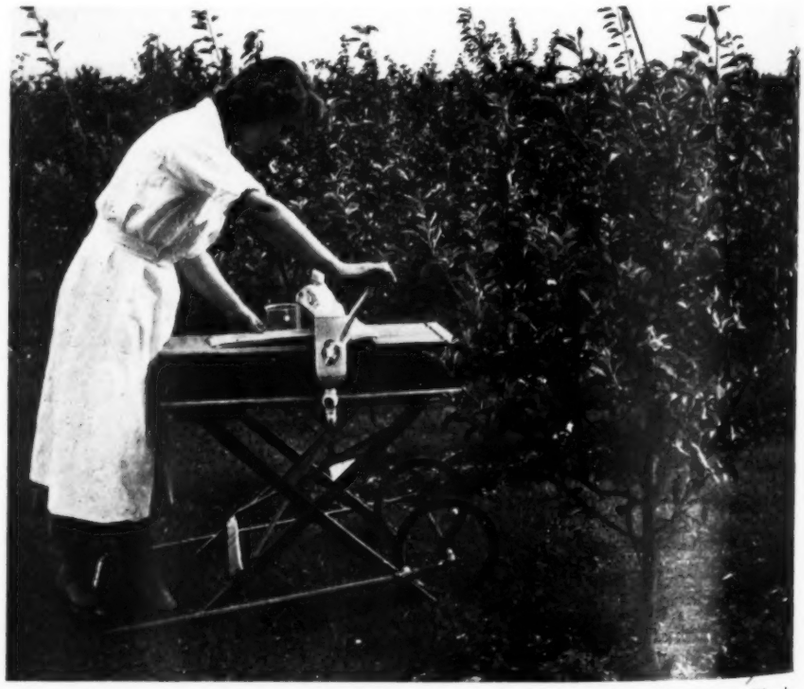
Agricultural Research Centre

The new extensions to the Shell Woodstock Agricultural Centre, Sittingbourne, Kent, were opened on Tuesday, 15 May, by Sir William Slater, Secretary of the Agricultural Research Council.

Woodstock, formerly a farm, and still partly operated as a farm unit, has been extended to co-ordinate all Shell's agricultural research outside the U.S.A. and Canada. The major activities will be the research for new agricultural chemicals, such as insecticides, fungicides and weedkillers and the solution of problems connected with the use of existing products.

Woodstock Agricultural Research Centre is now the headquarters of all agricultural research carried out in Europe by the companies of the Royal Dutch/Shell Group. Up to 1954 responsibility for this research was divided between Woodstock and the Group laboratories in Amsterdam. As a result of the amalgamation, many of the present research staff came over from Holland to make their homes in England and to work at Woodstock.

The functions of this consolidated laboratory are threefold: (1) basic research to discover new agricultural chemicals; (2) the development and testing of new products; (3) the solution of specific problems which arise from experience in the use of these new products.



Among the entomologists at Shell's Woodstock farm is Miss June Streeter. She is using a method for estimating fruit red spider mite (Megatetranychus ulmi). *Leaves are selected at random from the trees under investigation and placed between two sheets of semi-absorbent paper; these are held firm between sheets of plastic and then put through a mangle with rubber rollers. In this way the crushed impressions of the eggs, nymphs and mites are obtained as distinctive red marks on the green coloured leaf impression*

NEW PUBLICATIONS

Silage

By Stephen J. Watson, D.SC., F.R.I.C., F.R.S.E., and A. M. Smith, PH.D., D.SC., F.R.I.C., F.R.S.E. 2nd edition. Pp. 144, illustrated. London: Crosby Lockwood and Son Ltd. 13s. 6d.

This, the second edition of an already well-known work, is a valuable contribution to present-day knowledge on many aspects of silage and silage-making. It forms part of a series dealing with agriculture and horticulture published under the general editorship of H. C. Long, I.S.O., B.SC. (AGRIC., EDIN.).

In view of the fact that the British 1956 annual price review has given official encouragement to silage-making in Britain, the subject now is of greater interest to farmers than ever before. Not only is silage-making of great benefit to the individual farmer, but, in view of the difficulties (mainly economic) in importing cheap feeding-stuffs, the maintenance of home-produced feed is of importance to the national economy.

In his review of the first edition the late Sir Harold Tempany said: ' . . the wartime silage campaigns did not obtain the results hoped for. Many farmers thought that the reorganisation of their cropping for, as they imagined, the duration of the war was not justified and if they did make silage at all it was in a somewhat casual manner. Now many more are making silage regularly and regard the operation as one of the recurring jobs of the farming year, just as are muck spreading, hoeing and haymaking. However, there is still a vast amount of material capable of being made into silage, much of which is at present lost and the authors of this work advocate a more general recognition of silage as an essential part of dairy and beef farming, as is the case in North America and New Zealand, where almost every farmer who has stock to feed makes silage in one form or another '.

The authors of this book, both accomplished men, have been at great pains to bring this second edition up to date. They have included material on recent developments, such as baled silage and self-feeding, and have also incorporated new data on the food value of silage.

The reticence of the British farmer to make silage could well be overcome if he has the opportunity to read this book. It is a praiseworthy attempt to assist dairymen, stock-raisers and all progressive farmers, not only in Great Britain, but also overseas, for much of the information it provides is applicable to other countries. E.L.B.

Chemical Weed Control

This booklet, ' Chemical Weed Control with Monsanto 2:4-D,' is published as Technical Service Bulletin No. 8J/1. It discusses most aspects of weed control with 2:4-D. Such headings as the ' Effect of Weather and Soil Conditions ', ' Time of Application ', ' Methods of Application ' and ' Choice of 2:4-D Derivatives ' are treated thoroughly.

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East Malling Report, 1955

The 1955 Annual Report published by the East Malling Research Station consists of four parts as in former years. The first part gives a short summary of the work on the farm and the crops produced, including all its branches, fruit, arable, nurseries and glasshouses. This is followed by a review of the research programme in Part II, which draws attention to the results emerging from the various investigations in progress. This section also includes a list of works published during the year.

More than half the journal is, however, occupied by Parts III and IV, which contain research papers and bulletins for growers; these cover a wide range of subjects. Some of those in Part III may be considered too specialised for the practical fruit-grower, but many contain easily accessible information of direct value to him. This part also includes the full text of the Amos Memorial Lecture on the nutrition of fruit crops, by Professor T. Wallace.

Amongst the topical subjects discussed are: the effect of grass length and species on the soil moisture supplies; fruit thinning; the suitability of stools or fruiting bushes of black currant as sources of cutting; bacterial leaf spot and spur wilt of cherries and their control; the production and distribution of virus-free fruit trees and strawberry runners; notes on interesting insects during the year; descriptions of mites and allies of the winter moth, with keys to aid in their identification; the control of codling moth and the fruit tree red spider; descriptions of beneficial lacewings, ladybirds and hover flies. More technical papers report on the selection of a tasting panel, measurements of growth, physiological studies on growth, behaviour and composition of plants, a method of growing apple trees in water culture, a newly described strawberry mosaic virus disease, and a study of wilt tolerance in hops. The report can be obtained from the Secretary, East Malling Research Station, near Maidstone, Kent, England. Price 12*s.* 6*d.*, U.S. $2.00.

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Geochemistry of Iodine

The plan of this book is essentially the same as that of its two predecessors in the bibliographical series of the Chilean Iodine Educational Bureau, London, namely, ' Iodine and Plant Life ' and ' Iodine Content of Foods '. It consists of three principal sections, an annotated bibliography of 400 scientific papers known to contain quantitative or qualitative facts about the presence of iodine in the inorganic world, a succession of 20 tables in which these data have been systematically classified, and a review which attempts to summarise and interpret the analytical findings thus assembled. This book is published by the Chilean Iodine Educational Bureau, London.

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I.C.T.A. Annual Report, 1954-1955

A most interesting part of the Imperial College of Tropical Agriculture report concerns the various scientific departments, particularly the work of the Department of Botany and Plant Pathology. It is reported that Dr. W. L. Gordon, of the University of Manitoba, worked in the department from January until April to extend his taxonomic researches on the genus *Fusarium*. This study was undertaken to learn the identity and range of the *Fusarium* species that occur in Trinidad, as representative of a country with a tropical climate, and to deter-

mine whether or not these species found in both tropical and temperate climates are represented in nature by the same wild types. Collections and isolates of *Fusarium* were obtained from various habitats, including plants showing disease symptoms, soils, seeds, scale insects and the like. The results of this study have shown that 11 species were present among the collections and isolates of *Fusarium* made in Trinidad. The majority of the wild type strains of the species found in nature in Trinidad resembled closely in culture those of the same species encountered in Canada or in other parts of the world.

Further interesting work was reported in the section entitled Soils Research Scheme.

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B.S. 2748:1956

This British Standard for Returnable Wooden Containers for Cucumbers is one of a series covering boxes of various kinds for horticultural produce. The standard includes a recommendation that bodies and lids of containers complying with this standard should be marked with the number of the standard and it is hoped that all those concerned will adopt this practice. It will reduce the danger of non-standard lids being used with standard boxes, which they may or may not fit. London, British Standards Institution, 2*s.* 6*d.*

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Fisons Grassland Book

This book covers the correct fertiliser treatment for maximum output and explains the place of each of the main plant foods in grass growing—nitrogen, phosphate and potash. In addition, many other aspects of grassland management are covered; the establishment of leys—different soil types, preparing seed beds, weed control, hay and silage making and economics. This book contains information accumulated by Fisons Ltd. from their work over the years and represents a serious attempt to collate all the known information about grassland management in one publication.

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Empire Cotton Growing Corporation

According to the Annual Report for 1955–56 of the Council of the Empire Cotton Growing Corporation, production of cotton during the season 1954–55 in the areas where members of the Corporation's staff are or have been stationed totalled over 1.2 million bales for the second year in succession. The report emphasises the importance of early planting, early thinning and clean weeding, and says that these methods could increase Empire crops by many thousands of bales. The report goes on to say that improved yields from the newer strains have contributed considerably to the size of the crop, particularly in Nigeria and Tanganyika, where increases from these causes were estimated to amount to nearly 20%.

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The British Society for the Promotion of Vegetable Research

In this sixth Annual Report, under the heading of ' Irrigation ', it is stated that work was done on the development of a combined rain-gauge and evaporimeter which might be used by growers to determine how much irrigation water should be applied. Work has also continued at the National Vegetable Research Station, Wellesbourne, Warwickshire, England, on the study of annual weeds as affected by different manurial and cultural treatments used in a rotation of different vegetable crops grown on what had been corn land. Studies were also continued on the behaviour and life cycle of important annual weeds in vegetable crops.

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Other Publications

Protein Malnutrition in Brazil. Prepared by Dr. J. Waterlow and Dr. A. Vergara and published by FAO. Price $0.50 or 2*s.* 6*d.*

Plant Protection Guide to Pests and Diseases of Hops. London: Plant Protection Ltd.

The Foot-and-Mouth Disease Research Institute Report, 1954–55. Pirbright, Surrey. 1*s.* 0*d.*

Analysis of Forage Harvesting Patterns. Prepared by L. C. Cunningham and L. S. Fife. Bulletin No. 917. October 1955. Ithaca, New York: Cornell University Agricultural Experiment Station.

Effect of Curing Methods and Stage of Maturity upon Feeding Value of Roughages. By G. W. Trimberger, W. K. Kennedy, K. L. Turk, J. K. Loosli, J. T. Reid and S. T. Slack. Bulletin No. 910. October 1955. Ithaca, New York: Cornell University Agricultural Experiment Station.

Report of the Department of Conservation. 1955. Sydney, N.S.W.: Government Printer. 1*s.* 0*d.*

TEXTILES IN INDUSTRY

Industry, as it grows, creates needs for new materials—new metals, plastics, chemicals and, not least important, fibres. Today the industrial uses of textiles are growing; in the U.K., for example, some 30% of the viscose rayon spun is used for industrial purposes and in America the proportion is very much higher.

With the growing interest of industry in these special materials it was felt that there should be some form of liaison between the producers of industrial textiles and the industries for which they are designed. Leonard Hill Limited, publishers of 13 monthly technical journals, including the well-known and established *Fibres—Engineering and Chemistry*, have launched a new journal, *Textiles in Industry*. Each month its editorial pages will contain articles, news and views on the many industrial textiles available today as a guide to the hundreds of industries using them. The new journal incorporates its own enquiry card system so that readers may follow up items of particular interest.

Further particulars can be obtained from the publishers at Stratford House, Eden Street, London, N.W.1.

Point IV Mission in Ethiopia

This Mission completed its survey of the proposed site for the Coca Dam several months ago only to discover that the subsoil in that area was composed of volcanic ash, and it recommended that drillings in a new site downstream should begin immediately. No such action has taken place and it is understood at present that the Italians, who have had experience of building dams in southern Italy over similar soil conditions, will most probably start work on this dam as part payment of the Italian war reparations debt to Ethiopia.

The Agricultural School at Harar is due to be completed in August, two years late, and British companies have been awarded contracts by Point IV for supplying tiles (about £7,000) and electricity generators (about £20,000) for this college which will contribute towards making Harar ' the Oxford of Ethiopia '.

WORLD CROP REPORTS

ECUADOR

Bananas.—Banana production continues to flourish, although some slight falling off in the high figures of 1955 was noticeable at the turn of the year. It has been suggested that in the future any official support for the banana industry should be directed towards an improvement in quality rather than quantity. This is understandable when it is considered that low-grade or under-sized stems rejected by the buyer are for the most part wasted.

MEXICO

Cotton.—It is estimated that 1956–57 cotton crop will amount to 1,878,000 bales. Most of this crop will come from Matamoros (425,000), Mexicali, Lower California (400,000), Sonora (392,000), Laguna (300,000), Delicias (190,000) and Sinaloa (66,000).

Wheat.—The authorities confidently expect that the 1956 wheat crop will reach 1 million tons, more than sufficient to meet local needs. C.E.I.M.S.A. the Government food agency, will receive a credit of Ps. 350 million (35.06 Pesos = £1 sterling) from the Bank of Mexico for the purchase of the crop, estimated at 550,000 tons, from the State of Sonora.

ITALY

Wheat

Prospects for the Italian wheat crop are favourable, despite exceptionally bad winter weather, according to first reports from producing centres. The condition of the crop was satisfactory at mid-May, and the only major consequence of the frost was expected to be a delay of about 20 days in ripening. Consequently, threshing this year was not expected to start before late June instead of end-May as usual.

Last year the crop totalled 9½ million tons, which was almost sufficient for requirements, only 67,000 metric tons having to be imported. This year's yield is expected to be slightly lower.

CEYLON

Rubber plantations

Although the total acreage under rubber in Ceylon has remained constant since the war, a greater proportion of that acreage is in the form of very small holdings, says a census report. Rubber estates exceeding 10 acres have dropped by 13,000 acres during the last 11 years, whilst the area of holdings under 10 acres increased by the same amount. The report states that the average yield of rubber from all holdings is going up again now after a period of decline. The peak years for yield were 1943 and 1950 with 392 lb. per acre each. Sharply rising in 1950, it declined again over the next three years, but started climbing again, reaching 360 lb. per acre in 1954. The pattern of ownership of rubber holdings given by the census is that Singhalese own 62% of the acreage, Europeans 35% and others 3%.

Tea

Production of tea in Ceylon during February amounted to 25.2 million lb., which was 6.1 million lb. less than in the corresponding month last year.

RHODESIA and NYASALAND

Despite the fact that there should be a record maize crop this year, the Grain Marketing Board has made no provision for exporting any surplus. Mr. C. Agate, commercial manager of the Board, said on 14 April that the higher rate of consumption which has been apparent during the last few months would probably relieve the situation. The estimated crop for 1955–56 is 3 million bags, exceeding the largest yield in 1953–54 by some 300,000 bags. The handling of the record crop would undoubtedly create difficulties, it was said. A considerable proportion of the increased production would be on the Shamva and Sawi railway lines, which have a limited carrying capacity.

CANADA

An end-of-May report from Canada states that normal temperatures and relatively light rainfalls have permitted rapid progress toward the completion of seeding in the prairie provinces during the past week, according to the Dominion Bureau of Statistics. With minor exceptions, wheat seeding is from 85 to 100% completed and a large proportion of the coarse grains and flax is also sown.

While subsoil moisture reserves are generally adequate, surface moisture supplies are becoming rapidly depleted in most areas, with spring rainfall to date considerably below normal. Good rains are now needed to promote germination and growth, especially in the central and northern areas of Alberta, south - western Saskatchewan and south-western Manitoba.

LIBYA

Harvest prospects in the coastal belt of Tripolitania improved as the result of a good rainfall during March. Some damage was done by flooding in the Tripoli area.

It has been announced that the U.S. Government are sending another 12,300 tons of wheat to Libya, of which 7,200 tons have already been despatched. This gift brings the total amount of wheat sent to Libya from the U.S.A. since the famine relief scheme started in 1954 to 57,200 tons, valued at U.S. $4.5 million.

U.S.A.

Small grains.—The development of small grains during the period 7–13 June was stimulated by mostly sunny skies over practically the entire country. The weather was warm most of the time in the Great Plains, the eastern Rockies and the Upper Mississippi Valley, and there was a change to warmer late in the week in the east and far west, according to the U.S. Department of Commerce Weather Bureau report for the period 2–8 June.

Showers, mostly light, occurred on one or two days in many middle and northern areas. The most important brought about ½ in. of moisture—2 in. in some places—to the area from eastern Oklahoma and western Arkansas northward over the middle and eastern Great Plains, and about ½ in. to the panhandle of Texas and Oklahoma.

The showers caused some interruptions of harvest in Texas, Oklahoma and southern Kansas, but were beneficial further north.

There was little rain in the western portion of the Great Plains and hot, windy weather depleted soil moisture rapidly, especially in eastern Montana.

Maize.—The rapid growth of maize was favoured by light showers in the central and north central interior areas in the first part of the week, which helped to maintain mostly adequate moisture and hot days with day-time temperatures well up in the 90s by the weekend.

In Ohio the crop was 80% planted and in the remainder of the main belt it was virtually all planted. Planting was also rapid in the north-east, where it had previously been delayed by cold and wet soil. In Iowa 80% of the crop received its first cultivation.

Rain, however, was still needed in the south, where the crop was beginning to suffer in many places, particularly in Alabama and Georgia.

PANAMA

Bananas.—The Chiriqui Land Co. has announced a record production of 8,339,731 stems of bananas in Panama during 1955. Nearly a quarter of these stems were shipped from the port of Almirante on the Caribbean coast, rehabilitated some five years ago by the company after having been abandoned for several years. The record production was said to be due to extensive land reclamation and to the absence of labour difficulties.

Spec. Reg. Inform. Serv.

ENGLAND AND WALES

Agricultural conditions in England and Wales on 1 June, 1956, have been summarised by the Ministry of Agriculture, Fisheries and Food.

The dry weather has retarded the growth of corn crops. Potatoes suffered frost damage and are also in need of rain. Root crops are less forward than usual. Pastures made little growth and hay yields are expected to be considerably below average. Livestock are in satisfactory condition.

Weather conditions.—The weather during May was mostly very sunny and notably dry. Ground frosts were widespread for several nights in the third week and there was slight air frost. Apart from showers, there was little or no rain until the latter part of the month.

Corn crops.—In most parts of the country the low rainfall has retarded the growth of corn crops and rain was badly needed at the end of the month.

Autumn-sown wheat looks well generally, although not so forward as usual in some areas. Damage by wheat-bulb fly is reported from several districts. *Spring-sown wheat:* Earlier sowings look fairly well, especially on the heavier land, but some later sown crops have been affected by the drought.

The *autumn-sown barley* which survived the winter frosts is generally satisfactory, although in some areas it is rather thin and suffering from lack of moisture. *Spring barley* looks well, on the whole, especially early sowings, but some of the later sowings are uneven and losing colour.

Autumn-sown oats are healthy, although thin in some districts. *Spring-sown oats* are generally satisfactory, but some crops on lighter soils and some later sowings are showing the effects of drought.

Rye is making satisfactory progress.

Beans for stockfeeding.—Winter beans are generally satisfactory, but backward and inclined to be short in the straw. *Spring beans* are generally healthy, but rather backward; some damage by weevil is reported.

Peas are generally healthy, but not as forward as usual. Pigeons have been troublesome and damage by weevil—serious in a few areas—is reported.

Potatoes.—Early potatoes are backward. Damage by frost—severe in some cases—is reported from many districts. *Second early and maincrop varieties* have been slow to make growth owing to the dry weather, but look healthy. Frost damage is reported from several areas.

Roots.—Turnips and Swedes: Lack of rain delayed sowing in several areas.

INTERNATIONAL

Tobacco

The world tobacco market remains rather stable, though tobacco surpluses in the United States have reached a record high level in the 1955–56 season. World production, trade and consumption expanded in 1955 and production and consumption are expected to continue upwards in 1956. No price decrease is expected in spite of surplus stocks. Acreage and marketing controls for various leaf types will assure in the long run the necessary adjustment of supply to demand, and until adjustments of production take place stabilisation purchases or loan arrangements financed by governments are frequently used as a means of providing equilibrium. However the price stabilisation measures applied in a number of countries tend towards a relatively high level of tobacco prices, stimulating increases in yields and area where possible.

The principal cigarette tobaccos, flue-cured Virginia, Burley and Oriental, account for more than 50% of world production, against 33% in prewar years. In the United States output of flue-cured leaf in 1955 increased about 13% over 1954; decreases in Canadian and Indian outputs were compensated by the rapid increase in Japanese and Philippine production. Japan now ranks third among world producers of flue-cured leaf, coming only after the United States and China.

Sugar

Spain.—We are informed that, barring unexpected developments, a sugar crop from both beet and cane of 400,000 to 450,000 tons is expected in Spain this season.

Domestic consumption is increasing and stands now at about 300,000 tons. Most of this expansion is in the retail trade as opposed to manufacturers' requirements.

As to exports, it is rather too early to count upon the apparent surplus being available until Government policy is clearer.

Germany (West).—The dry weather experienced during the past few weeks has enabled farmers to proceed with field work, so that fields are now looking very tidy, with singling completed in many cases. Steady rain is greatly in demand.

A number of reports have been received, according to F. O. Licht, of the appearance of beet fly, whilst there have been isolated instances of carrion beetle and root-rot in the south.

French Union.—Production in cane-growing areas of the French Union over the past four seasons was as in Table 1, according to F. O. Licht.

TABLE 1
METRIC TONS, RAW VALUE

	Reunion	*Martinique*	*Guadeloupe*
1951–52	129,000	96,000	38,000
1952–53	157,000	87,000	54,000
1953–54	171,000	103,000	70,000
1954–55	175,000	116,000	82,000

Czarnikow Rev.